Feb. 21, 1939. P. VAN ACKEREN 2,147,681

HORIZONTAL CHAMBER COKE OVEN

Filed Aug. 8, 1935 2 Sheets-Sheet 1

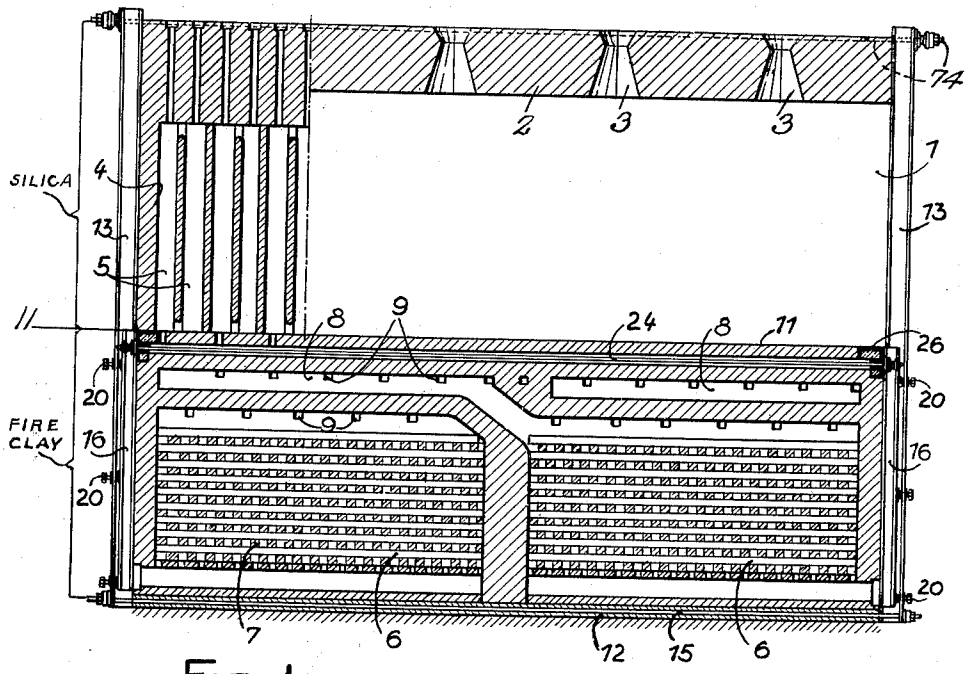


Fig. 1

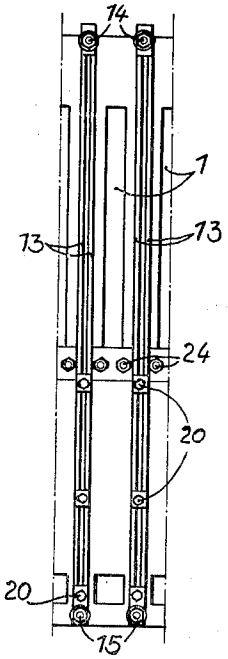


Fig. 2

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Fig. 3

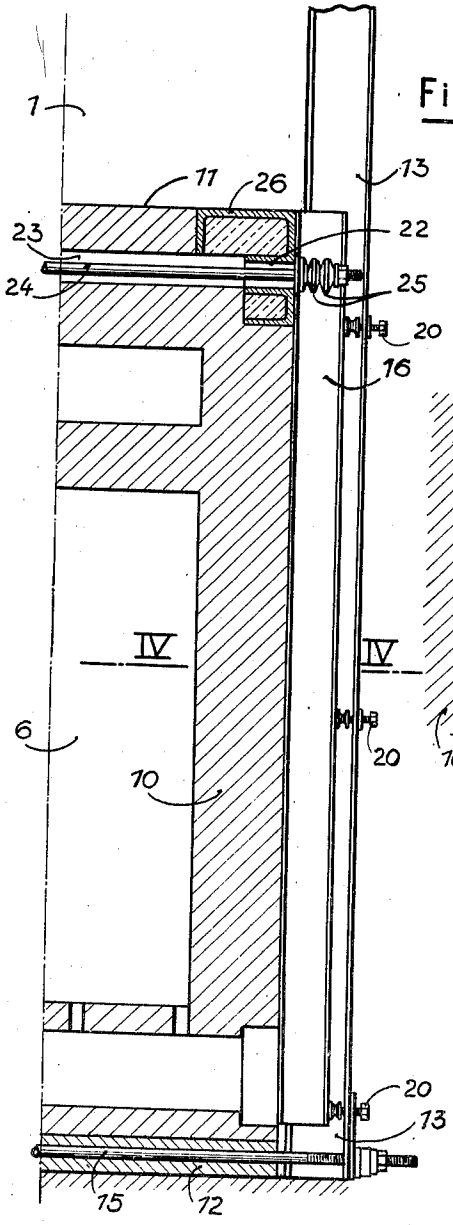
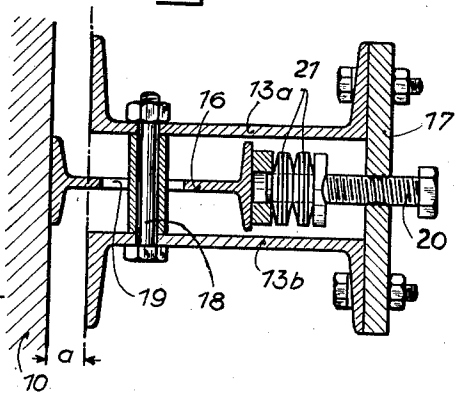


Fig. 4



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HORIZONTAL CHAMBER COKE OVEN

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Application August 8, 1935, Serial No. 35,254
In Germany March 31, 1934

4 Claims. (Cl. 202—268)

This invention relates to horizontal chamber coke ovens for the production of gas and coke and has for its object to construct the coking ovens in such a way that the oven has a high efficiency and is cheap to construct.

The main object of the invention is to use for the construction of the upper part of the coke oven a brick material which is very resistant to the action of fire, such as silica bricks, and for the walls of the coking chamber traversed by heating passages, as far as the chamber floor, and the lower part of the oven a cheaper material, less resistant to fire, such as fireclay.

The invention also comprises a new fastening for the oven brickwork on the side walls of the ovens. The fastening according to the invention makes possible the use of brick materials with different heat expansions at various zones of the ovens without breakages or cracks in the oven as a result of the different expansion of the fireproof bricks.

The invention finally comprises a special method of heating-up ovens constructed from bricks with different heat expansions, from the normal temperature to the operative temperature without the formation of cracks and leakages on account of the differing expansions of the bricks.

Hitherto the brickwork of horizontal chamber coking ovens for the production of gas and coke has been constructed from brick material of uniform composition. For example many coke ovens were constructed entirely of fireclay brick or entirely of silica brick. As silica material is considerably more expensive but its use has advantages in the production of high heating passage temperatures, it has been proposed to construct the lowest layers of the oven structure or the regenerators lying under the coking chamber of cheaper fireclay material. However such a use of fireclay material in coke ovens chiefly constructed of silica brick is limited to such parts of the brickwork in which there is no space under a varying pressure. This is the case for example with regard to the brickword layers in the base of the regenerators where the expansion is very small on account of the low temperatures in the zone.

On the other hand, for the more highly heated parts of the ovens from the regenerator passage upwards, it has been usual hitherto to use a uniform brick material of regular expansion. It has not been considered possible hitherto to use different brick materials, for example, part silica and part fireclay in the more highly heated parts of the oven as it was feared that cracks would be caused in the inner walls of the oven on account of the different expansion of the bricks, which would result in the loss of valuable heating gas and the formation of dangerous thin flames on the inside of the oven.

According to the present invention the brickwork of the coke oven is constructed of different materials as follows: the lower part of the oven as far as the base of the coking chamber is constructed of fireclay bricks or the like and the upper part of the oven, especially the heating walls of the coking chamber are made of silica. In this method of construction it is possible to construct the oven brickwork in such a manner that the silica heating walls can expand independently of the fireclay regenerator part so that cracks neither occur in the heating walls nor in the walls of the separate regenerators.

In order to obtain this result with safety namely the independant expansion of the separate parts of the oven structure, according to the present invention the fastening is in addition constructed in such a manner that the upper part of the heating wall, as well as the regenerator part, is maintained at the necessary tension.

The fundamental solution of this problem, according to the present invention, lies in the fact that the usual vertical supports, which extend over the whole height of the oven battery, are provided with a horizontally adjustable vertical support, flexibly fixed on the main support, in the section lying opposite the fireclay brickwork of the oven block. It is possible, by means of the special arrangement of the auxiliary supports on the traversing support, to maintain the lower part of the oven battery, constructed for example of fireclay, under tension even if the upper part of the battery, constructed of silica, is considerably expanded. Whilst in the fastening usual hitherto the main support has been raised from the lower part of the brickwork, according to the invention the auxiliary support is positioned against the main support in such a way that its inner surface remains fixed to the fireclay brickwork, independently of the position of the main support, and it is maintained at the necessary tension.

Fig. 1 of the drawings shows a vertical section through an oven battery constructed according to the invention,

Figure 2 is a part side view of the oven battery,

Figure 3 shows a part of the new type of fastening on a large scale and

Figure 4 is merely a horizontal section of the fastening on the line IV—IV of Fig. 3.

In the coke oven battery illustrated in Fig. 1 the usual horizontal coking chamber 1 serves to receive the coal and its cover 2 is constructed with filling openings 3 for filling in the coal. The walls of the chamber 1, which is provided with door openings on both ends, is made of fireproof brickwork 4 in which are provided vertical passages 5, in which gas and air are burned in order to heat the chamber walls. In the oven illustrated in the drawings the vertical heating passages 5 are constructed as the so-called circulatory heating passages.

In order to produce the flame temperature necessary to obtain the required temperature in the heating passages, air for combustion or air for combustion and gas is preheated in the regenerators which are arranged under the horizontal coking chambers. The regenerators consist of chambers 6 which are constructed as is usual with fireproof grid work. The grid work chambers are connected to the heating passages by passages 8 and 9. As usual, in each operative period one regenerator 6 serves for preheating the media, whilst the other regenerator 6 is traversed by the hot exhaust gases which give up part of their heat to the fireproof brickwork. In the next operative period the path of the gases is changed. The media are heated in the regenerator previously heated by the hot exhaust gases. The entire brickwork of the oven battery consists of separate bricks which are united with each other by means of a suitable mortar. In order to render harmless the expansion and stresses occurring inside the structure when heated, a so-called fastening is provided, outside the brickwork which holds the oven battery firmly together. This fastening consists essentially of vertical stanchions 13 which extend over the longitudinal side of the battery between the individual oven chambers 1. The stanchions 13 are held together on top by means of tie bars 14 which lie on the cover of the oven battery. The stanchions 13 are connected at their lower ends by tie bars 15, which are arranged in the passages of the base 12 of the oven battery.

The regenerator part 10 of the oven installation which reaches from the base 12 to the line 11 consists in the oven illustrated on the drawings of fireclay, whilst the heating walls which extend from the line 11 to the cover 2 of the coking chamber consist of silica material very resistant to the action of heat.

The fireclay material has a considerably smaller heat expansion than the silica material. In practice, with a fastening of the usual type this had the effect of raising from the brickwork the stanchions 13 in the lower part of the battery to an extent equal to the increase of expansion of the heating wall part of the battery over the regenerator foundation. As soon as the fireproof brickwork is no longer under tension cracks very easily occur, an occurrence which it is essential to avoid, particularly in the regenerator part of the battery.

In order to keep the fireproof brickwork in the regenerator part of the oven under tension independently of the super-structure auxiliary stanchions 16 capable of transverse movement are provided on the stanchions 13.

The exact construction of the stanchion can be seen from Fig. 4. The main stanchion consists of two U-irons 13*a* and 13*b* which are held together by the fish plate 17 and spacer bolt 18. In the space between the irons 13*a* and 13*b* there is arranged a double I-iron 16 serving as an auxiliary stanchion, which has slots 19 for the screw connection 18 of the main stanchion 13. Adjusting screws 20 which are arranged in the connecting plate 17 of the irons 13*a* and 13*b* act on the auxiliary stanchion 16 whilst the usual plate springs 21 are arranged between the adjusting screw 20 and the auxiliary stanchion 16.

The screws 20 are now adjusted in such a way that the auxiliary stanchion 16, which extends over the entire height of the lower part of the oven constructed of fireclay, lies firmly against the fireclay part of the oven, whilst the main stanchion 13 extends adjacent the silica part of the oven, but a definite distance *a*—as shown in Fig. 4—from the fireclay brickwork 10. This distance *a* corresponds essentially to the difference in the heat expansion of the different fireproof materials.

The invention further consists in a new method of rendering harmless the friction arising between the contacting surfaces of the different types of brickwork when heating a coke oven battery which consists of brickwork of two different materials. This friction is as a rule so extensive that the bricks of the brickwork with the smaller expansion are torn apart from each other by the brickwork, with the larger expansion.

In the coke ovens whose basic construction corresponds in some extent to that illustrated in Fig. 1 of the drawings the harmful friction occurs between the two brick materials in the place indicated by the line 11. In order to be sure that this frictional force is made ineffective the upper edge of the brickwork 10 is provided with a box-like reinforcement 26 which surrounds the topmost layer of the brickwork 10. The reinforcement 26 has an opening 22 which leads to the horizontal rich fuel gas passages 23 lying under the heating passages. When heating up the oven these rich fuel gas passages are not needed at first. On this account it is possible temporarily to introduce in the heavy gas passes 23 tie bars 24 which act on the reinforcement 26 of the fireclay brickwork by means of plate springs 25. The technical effect of the special ties 24 and the reinforcement 26 which secures the fireclay brickwork against breakage is obvious. The greater expansion of the silica heating walls now has the effect of causing the brickwork of the silica heating walls to move relatively to the fixed fireclay brickwork, until the normal condition of the battery, corresponding to the operative temperature, is attained.

It is known that the expansion of silica and fireclay bricks is approximately the same above about 400°. Accordingly it is possible to remove the ties 24 after the oven brickwork has attained a temperature of about 400–500°. At this temperature the relative movement of the silica brickwork to the fireclay brickwork has ceased.

I wish to be understood that the invention is disclosed in the foregoing merely by way of example and that it is of course not limited to this example. In the contrary, I expressly reserve the right to carry into effect my invention in any desired manner coming within the scope of the appended claims.

I claim:—

1. A horizontal chamber coke oven for the production of gas and coke with heating walls on opposite sides of an intervening coking chamber, and regenerators lying underneath the coking

chamber and heating walls, and with the upper part of the oven brickwork including the top of the coking chamber and the heating walls and their flues down to at least the floor of the chamber consisting at least for the greater part of silica brick, and the lower part of the oven brickwork consisting at least for the greater part of material with a different heat of expansion like, for example, fireclay, characterized by main stanchions extending the entire height of the oven upwardly alongside the outer ends of the heating walls and spaced from said lower part of the oven, and auxiliary stanchions interposed between the main stanchions and said lower part of the oven from the bottoms of the regenerators to the tops thereof and mounted on said main stanchions for adjustment relative thereto, and adjustable means on the main stanchions for adjusting and urging the auxiliary stanchions from the main stanchions toward and against said lower part of the oven brickwork.

2. A horizontal chamber coke oven for the production of gas and coke with heating walls on opposite sides of an intervening coking chamber, and regenerators lying underneath the coking chamber and heating walls, and with the upper part of the oven brickwork including the top of the coking chamber and the heating walls and their flues down to at least the floor of the chamber consisting at least for the greater part of silica brick, and the lower part of the oven brickwork consisting at least for the greater part of material with a different heat of expansion like, for example, fireclay, characterized by main stanchions extending the entire height of the oven upwardly alongside each of the outer ends of the heating walls and spaced from said lower part of the oven, and means for tieing stanchions at opposite ends of the heating walls to each other at the base and top of the oven, each of said stanchions comprising spaced bars, an auxiliary stanchion mounted between the spaced bars of each stanchion and interposed between the stanchion and said lower part of the oven from the bottoms of the regenerators to the tops thereof, and adjustable means mounted at spaced intervals along each of said main stanchions for adjusting and urging the auxiliary stanchion therefor from the main stanchion against said lower part of the oven.

3. A horizontal chamber coke oven for the production of gas and coke with heating walls on opposite sides of an intervening coking chamber, and regenerators lying underneath the coking chamber and heating walls, and with the upper part of the oven brickwork including the top of the coking chamber and the heating walls and their flues down to at least the floor of the chamber consisting at least for the greater part of silica brick, and the lower part of the oven brickwork consisting at least for the greater part of material with a different heat of expansion like, for example, fireclay, and provided with rich fuel gas distributing channels in the topmost layer of brick material like fireclay just below the level of the coking chamber floor and extending from one side to the other of the oven, characterized by temporary tie rods temporarily inserted through said rich fuel gas channels and extending from one side to the other, and means associated with each end of said tie rods for tieing the brickwork of material like fireclay together temporarily during heating up of the oven, said tie rods and said means being removable after the oven is heated up for connection of rich gas supply means with said channels, and means at the sides of the oven for maintaining the brickwork of material like fireclay under compression when the aforesaid temporary tie rods are removed, said means comprising vertical stanchions at the sides of the battery for confining the bricks under compression.

4. In the heating up of a horizontal chamber coke oven for the production of gas and coke with heating walls on opposite sides of an intervening coking chamber, and regenerators lying underneath the coking chamber and heating walls, and with the upper part of the oven brickwork including the top of the coking chamber and the heating walls and their flues down to at least the floor of the chamber consisting at least for the greater part of silica brick, and the lower part of the oven brick consisting at least for the greater part of material with a different heat of expansion like, for example, fireclay, and provided with rich fuel gas distributing channels in the topmost layer of brick material like fireclay just below the level of the coking chamber floor and extending from one side to the other of the oven, the method comprising: during the heating of the aforesaid oven to the normal operating temperature temporarily extending horizontal tie bars through the rich fuel gas channels from one end to the other of the longitudinal sides of the battery, maintaining the lower part of the material like fireclay under compression independently of the upper part of silica brick by tightening the tie rods at both sides of the battery against lateral metal covering for the brick around said channels, and removing the tie rods from the rich gas channels after the temperature of the brickwork has been raised to the point at which heat expansion of the two different kinds of brick material is approximately the same, and thereafter maintaining the fully expanded fireclay brickwork under compression by means of vertical stanchions to hold the brickwork together after the rods are removed.

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