CHAMBER OVEN FOR THE PRODUCTION OF GAS AND COKE

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This invention relates to chamber ovens for the production of gas and coke, having heating passages in the walls forming the coking chambers, and regenerators which are connected directly with the heating passages and to which the gaseous medium (air or fuel gas) is supplied from one or several distributing passages extending over the whole length of the regenerators. The invention has more particular reference to horizontal chamber ovens for the production of gas and coke with vertical heating passages in the walls of the chambers and the regenerators lying thereunder, which are directly connected to a part or the whole of the heating passages.

The object of my present invention is to provide improvements in the said chamber ovens for the production of gas and coke, so that the gaseous medium necessary for the combustion process, i.e., the air for combustion alone, or the air for combustion and fuel gas in different quantities according to the coking time desired, can be uniformly distributed to the heating passages, without it being necessary to have regulating devices in operation inside the oven building.

The invention fundamentally resides in that for every regenerator there are provided two separate distributing passages substantially parallel to each other to one end of which for example can be controlled and whose openings connecting them to the checker work chamber of the regenerator are of such dimensions, that the cross-section of these connecting openings is calibrated along the separate passages, in equal or unequal gradation, becoming greater for one and smaller for another passageway from the entry opening for gas or air thereto.

A further object of my invention is to use the above mentioned solution of the problems of the invention in a specially suitable form with such horizontal chamber ovens for the production of gas and coke, which have regenerators (cross regenerators) under the heating walls at right angles to the longitudinal axis of the battery, and which are separated in half of the longitudinal axis of the battery and are connected with a distributing passage on the other half of the battery, whilst the heating passages lying in one half of the battery are supplied with combustion media directly from the regenerator and the heating passages in the other half of the battery from the said distributing passage. A chamber coke oven of this kind is described for example in the German specification No. 525,812.

According to the present invention, with regenerative coking ovens of the last named type each regenerator is sub-divided longitudinally by means of a partition and the heating passages which lie directly over the regenerators are joined to one half of a regenerator and the distributing passage leading to the other half of the battery to the other half of the regenerator. The regenerator distributing passages provided with the new type of calibration of the connecting openings according to my present invention are thus only arranged under those halves of the regenerators which are directly connected with the heating passages lying over them, whilst for the other halves of the regenerators there are provided one or more distributing passages of the form usual hitherto.

I will now describe the nature of my invention with reference to the accompanying drawings whereof:

Figure 1 is a vertical cross section through a horizontal chamber coke oven constructed according to my invention.

Figure 2 is a vertical section through a part of a horizontal chamber coke oven battery according to my invention, on the line II-II of Fig. 1.

Figure 3 shows a horizontal section through a part of an oven battery according to line III-III of Fig. 1.

Figure 4 shows a vertical section through another form of construction of my invention.

Figure 5 is a part longitudinal section on the line V-V of Fig. 4 and a part section on the line V-Va of Fig. 4.

Figure 6 is a longitudinal section through a part of the oven battery on the line VI-VI of Fig. 4.

Figure 7 is a vertical longitudinal section through the form of regenerator reversal flow-box which is preferably used in my invention.

Figure 8 is a horizontal section on the line VIII-VIII of Fig. 7 and

Figure 9 is a horizontal section through another form of construction of the regenerator reversal flow-box, which is preferably used for the coke oven illustrated in Figs. 4-6.

In the horizontal chamber coke oven illustrated in Figs. 1-3 vertical heating passages 2 and 2a are provided in the walls of the coking chambers 1, which are connected in pairs to form the so-called hair pin flues. Regenerators 3 are arranged under the coking chambers and the heating channels extend parallel to the oven chambers and vertically relative to the longitudinal axis of the battery and are in operation under the entire length of the oven chambers.
The regenerators can if necessary be subdivided into compartments by means of vertical partitions, which fill a definite section of the chamber length. The regenerators lie next to each other in the longitudinal directions of the battery.

Of the two vertical heating passages of the hairpin flues, the heating passages 2a are connected with the regenerator 3 lying thereunder by means of connecting passages 5 whilst the other heating passages 2 are connected with the neighboring regenerator by means of the passages 5a, as shown in Fig. 2.

The regenerators are provided with the usual refractory chequer work.

Two sole passages 6 and 6a are provided under each regenerator and are separate from each other and extend parallelly under the chequer work chamber of the regenerator. These sole passages are connected to the chequer work chamber of the regenerator lying thereunder by means of the openings 7 and 7a. As shown in Fig. 3 the connecting openings 7 and 7a are of different dimensions. In the sole passages 6 the connecting openings 7 are larger from the side of the oven battery up till the middle of the ovens, whilst in the sole passage 6a the size of the connecting passages increases from the middle of the ovens towards the outside.

Common knee pieces or regenerator reversal flow-boxes 8 are joined to the outer ends of the regenerator sole passages for the two sole passages 6 and 6a of each regenerator.

As shown in Fig. 8 each knee piece has two connecting portions 9 and 9a of which the parts 9 lead to the sole passage 6 and the parts 9a to the sole passage 6a. Regulating plates 10 and 10a which preferably act independently of each other are provided in the parts 9 and 9a, and are formed in such a manner that air or gas in adjustable quantities can flow into the regenerator sole passages 6 and 6a or in one of the two, from the inner chamber 11 of the knee piece or portions. The connecting passage 13 leading to the exhaust reservoir passage is connected to the parts 12 of the knee piece. The opening of the parts 12 is closed by means of a plate valve 14 which can be actuated in the usual manner by means of mechanism 15 on the outside of the knee part. In addition the knee piece 8 has an opening 16 leading to the outside, which can be closed by a cover 17, and which is also actuated from outside by the mechanism 15. The mechanism 15 is formed in such a way that the air valve 17 and the valve 14 are alternately opened or closed. In the operating period in which air is supplied to the regenerator connected to the knee piece the air flap 17 is opened and the valve 14 shut. Alternately, in the operating period in which hot exhaust gas flows through the regenerator in order to heat up the chequer work, the air flap 17 is closed and the valve 14 is opened, so that the exhaust gas entering through the exhaust reservoir passage 12 and thence to the chimney.

When the coke oven is to be heated with a preheated gas, e.g. generator gas, a heating gas pipe is connected to a lateral opening 10 of the knee piece 8 of one regenerator of a pair as shown in Figure 1, which is controlled by a stop valve 20 and can be connected to the main gas pipe 21. In this case the mechanism actuating the air flap 17 is put out of action and the stop valve 20 is actuated in such a way that in each working period in which the air is introduced through the other regenerator of the pair, heating gas flows from the pipe 21 through the pipe 20 into the knee piece 8.

In order to obtain a tight connection between the knee piece 8 and the brickwork of the oven and to make it safe for the wall to expand or move on account of heating, a frame 22 is provided at the mouth of the sole passages 6 and 6a, of substantially U-shaped cross-section. The end of the tube pieces 5, 5a is inserted in the socket of the frame 22 and the intermediate space between the tube parts 9, 9a and the frame 22 is closed by means of an elastic packing band, for example, an asbestos band 23.

This new type of connection of the knee piece with brickwork of the oven has the advantage that on the one hand the connecting place is always held tightly and on the other hand the knee piece if necessary can easily be removed.

In operation with the new calibration of the connecting openings of the present invention between the regenerator sole passages and the respective chequer work chambers, with regard to the special formation of the knee pieces, we have the following:

If the regulating plates 10, 10a of the knee pieces, are both full open the gaseous medium is uniformly distributed to both regenerator sole passages 6 and 6a. The medium then enters into the regenerator chequer work chamber in a distribution which is conditional on the entire cross section of the connecting openings of both sole passages in each zone of the regenerator. If for example the regulating plate 10 of the sole passage 6 is closed, the medium flows into the regenerator chequer work chamber in a different state of distribution, the distribution being conditional on the calibration of the connecting openings of the single sole passage 6a which is opened. In the form of construction illustrated in the drawings this means that gaseous medium is supplied in a larger quantity in the outer half of the regenerator. The admission is reversed in the form of construction in which the sole passage 6a is closed and the sole passage 6 is opened. In between these two cases of the admission to the regenerator it will be now possible to obtain the most diverse intermediate stages in the distribution of the gaseous medium.

The action of the special calibration of the sole passage openings with regard to the distribution of varying quantities of gas or air over the entire extent of the regenerator is shown from the following.

In order to distribute gas or air from the sole passage uniformly over the entire length of the regenerator a definite throttling of the gas or air current under the regenerator chequer work is necessary. Naturally this throttling is only applicable for a definite quantity of gas or air, or only for a definite gas pressure under the connecting openings between the sole passage and the regenerators, or even a definite setting of the regulating plates 10, 10a it is now possible to obtain a pressure of gas in the two passages 6 and 6a such that the desired distribution of the medium over the regenerator chequer work chamber is obtained.

In this case the calibration of the openings 7 and 7a is preferably made other than that illustrated in Fig. 3 of the drawings.

For example the openings 7 of the sole passages 6 are of such dimensions that the relatively small quantity of gas necessary for 36 hours of work...
The connection between the heating passages and the regenerators or the passages 36 and 37 is such that, for example, the heat ducts 32 of each pair of heating passages are connected with the regenerators 33 on the other side of the battery with the corresponding passages 37, whilst the heating passages 31 in one half of the battery are connected with the regenerator 34 and in the other half of the battery with the passage 38 belonging to this regenerator.

Sole passages 43, 44 and 45 are provided under the regenerator chequer work for each regenerator 3. Of these sole passages the passage 43 is in connection with the chequer work chamber 25, that is, that part of the regenerator into which the passage 36 or 37 leads.

Two sole passages 44 and 45 are provided under the other regenerators section 40. The openings 44a, 45a, leading from these passages 44 and 45 to the regenerator chequer work, are calibrated in the way described before, for the regenerator sole passages 6 and 6a of the type of oven according to Figs. 1 to 3 of the drawings.

By means of this special calibration of the openings 44a and 45a it is possible to effect the 25 desired distribution of the gaseous media over the entire length of the regenerator.

In practice it is not necessary to have a variable distribution of the media in the regenerator sections 33, as the media flow from this regenerator part into the passage 31 or 36 from which they must be distributed anew. Similarly a variable distribution of the media is not necessary in this passage 37 as the other heating passages of the pair of heat ducts are connected to that section of the regenerator lying thereunder, in which it is possible to control the distribution of the gaseous media.

It can be seen therefore that with the type of oven according to Figs. 4 to 6 of the drawings, it is possible to obtain a definite distribution of the gaseous media over the entire extent of the heating walls of the coking chambers, independently of the quantity of gaseous media to be distributed, by means of the application of the principles of my invention.

In the type of coke oven described in Figs. 4 to 6 of the drawings, as previously explained it is preferable to take in hand or vary the distribution of the combustion media in those heating passages which receive gas or air out of the passage 36 or 37 from those regenerators through which exhaust gases pass in the same operative period. The exhaust volume is always somewhat larger than the volume of the cold media, it is necessary in this case to form the knee pieces or portions 46 and 47 in such a way that when opening the valve leading to the exhaust passages the regulating plate controlling the passages 44 and 45 is also adjusted. This last adjustment of the regulating plate must be such that the larger quantity of exhaust gases must also be sucked into the regenerator chequer work chamber in a uniform distribution. In order that the distribution of the media in the regenerators section 40, directly connected with the heating passages, shall be made in the most advantageous manner, it is preferable to provide vertical dividing walls 48 in this regenerator section.

The invention is illustrated in the drawings by way of example, for a horizontal chambered oven. My invention however can be used with equal advantage for vertical chamber or retort ovens, and above all for charging all such regenerators of large extent horizontally, and in
which the gaseous media are to be distributed from an opening in a definite manner over the entire regenerator checker work. Such a problem can also be solved for example with the regenerators of the known Siemens-Martin oven and in many air heaters for blast furnaces.

I would note particularly that my invention is in no way limited to the foregoing forms of construction, and it may furthermore be varied as desired within the limits of the following claims.

The right to make all further claims is strictly reserved.

I claim:
1. In a coke oven for the production of gas and coke comprising coke-making chambers alternating in position side-by-side with heating walls therefor comprising combustion flues, a regenerator chamber communicating with a plurality of said combustion flues, a plurality of sole flues for the regenerator chamber and each communicating therewith through separate series of connecting ports, a regenerator flow reversal box common to and communicably connected with each of the sole flues of the regenerator at one end thereof and having inlet means for introducing combustion media to each of the sole flues and outlet means for exhaust of waste gas from each of the sole flues of the regenerator, each of the sole flues extending from the flow reversal box throughout the length of the regenerator checker-work, the series of connecting ports for one sole flue decreasing in size from the flow reversal box to the other end of the regenerator and the series of connecting ports for another of the plurality of sole flues for the generator increasing in size from the flow reversal box to the other end of the regenerator, and regulable valve means for individually controlling the flow through each of the sole flues of waste gas to and combustion media from the regenerator flow box; whereby combustion media may enter the regenerator through the sole flue that has the ports decreasing in size from the regenerator flow box and the waste exhausted through the other sole flue, as well as reversely or through both flues simultaneously in adjustable quantities.

2. In a coke oven for the production of gas and coke comprising coke-making chamber alternating in position side-by-side with heating walls therefor comprising hairpin combustion flues, and regenerators arranged under the coke-making chambers and heating walls, said regenerators being operatively disposed in two groups respectively on opposite sides of the longitudinal central line of the oven and each regenerator of each group being divided by a partition into two compartments with one compartment communicably connected directly with one limb of the hairpin flues lying vertically over the regenerator and the other compartment communicably connected with one limb of the hairpin flues over the other group of regenerators by a horizontal passage extending between the other group of regenerators and the coke-making chambers and heating walls above the same, at least three sole flues for each regenerator, a regenerator reversal flow box for each of said regenerators, the flow box for each regenerator being communicably connected with the sole flues of its regenerator at one end thereof and having inlet means for combustion media and outlet means for waste gas, each of the sole flues of each regenerator extending from its reversal box throughout the length of the regenerator checker-work and having a series of ports for communication with the regenerator, at least one of the sole flues for each regenerator communicating through said series of ports with the compartment of the regenerator having the horizontal passage, and at least two of the sole flues of each regenerator communicating through said series of ports with the other compartment of the regenerator, each compartment with which at least two sole flues communicate having the series of ports decreasing in size for one sole flue and having the series of ports for another of its sole flues increasing in size from the reversal flow box to the other end of the compartment, and regulable valve means for individually controlling the flow through the sole flues of waste gas to and combustion media from their respective regenerator reversal flow boxes.

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