Jan. 8, 1935. F. TOTZEK 1,986,903

COKE OVEN

Filed Jan. 16, 1931 2 Sheets-Sheet 1

Fig. 1.

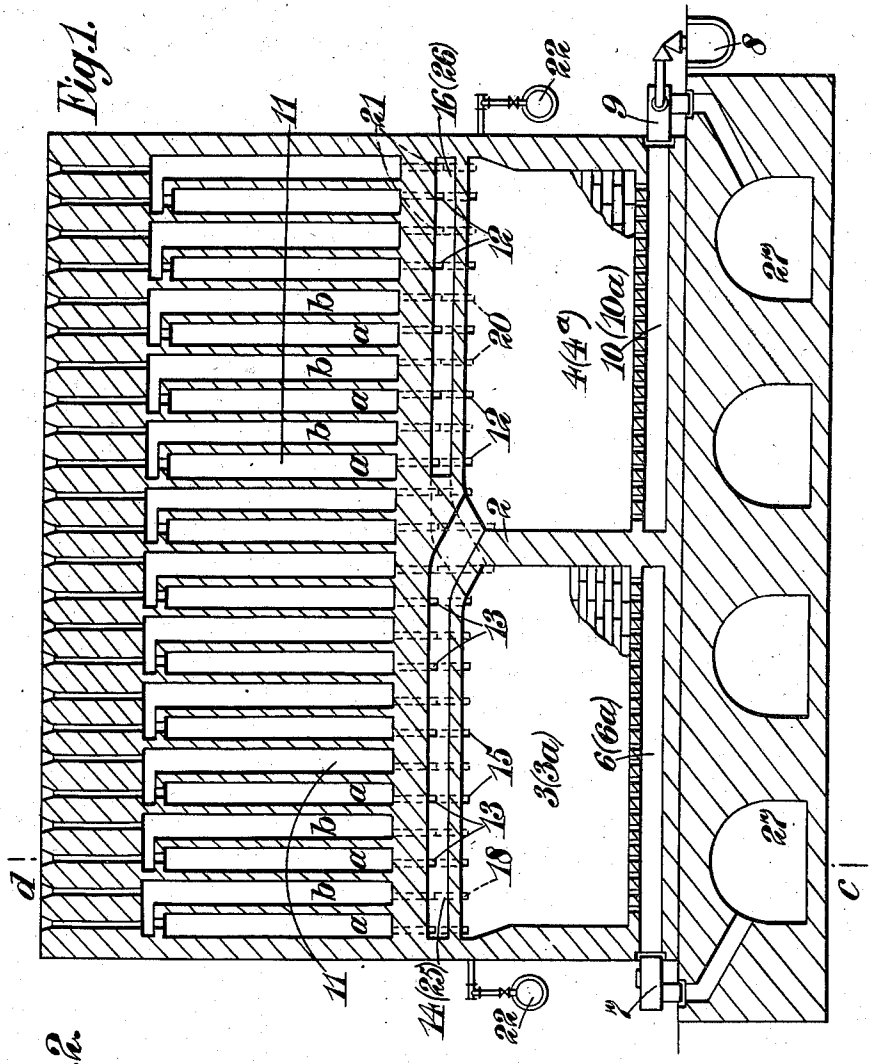
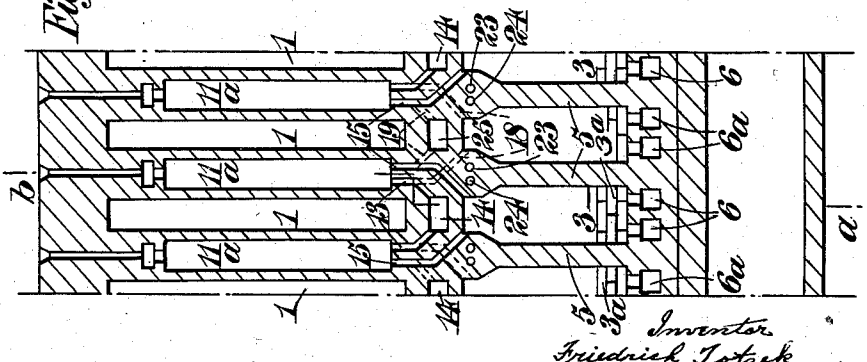


Fig. 2.



Inventor
Friedrich Totzek
By Henry Lord Clarke
his Attys

Jan. 8, 1935. F. TOTZEK 1,986,903

COKE OVEN

Filed Jan. 16, 1931 2 Sheets-Sheet 2

Fig. 3.

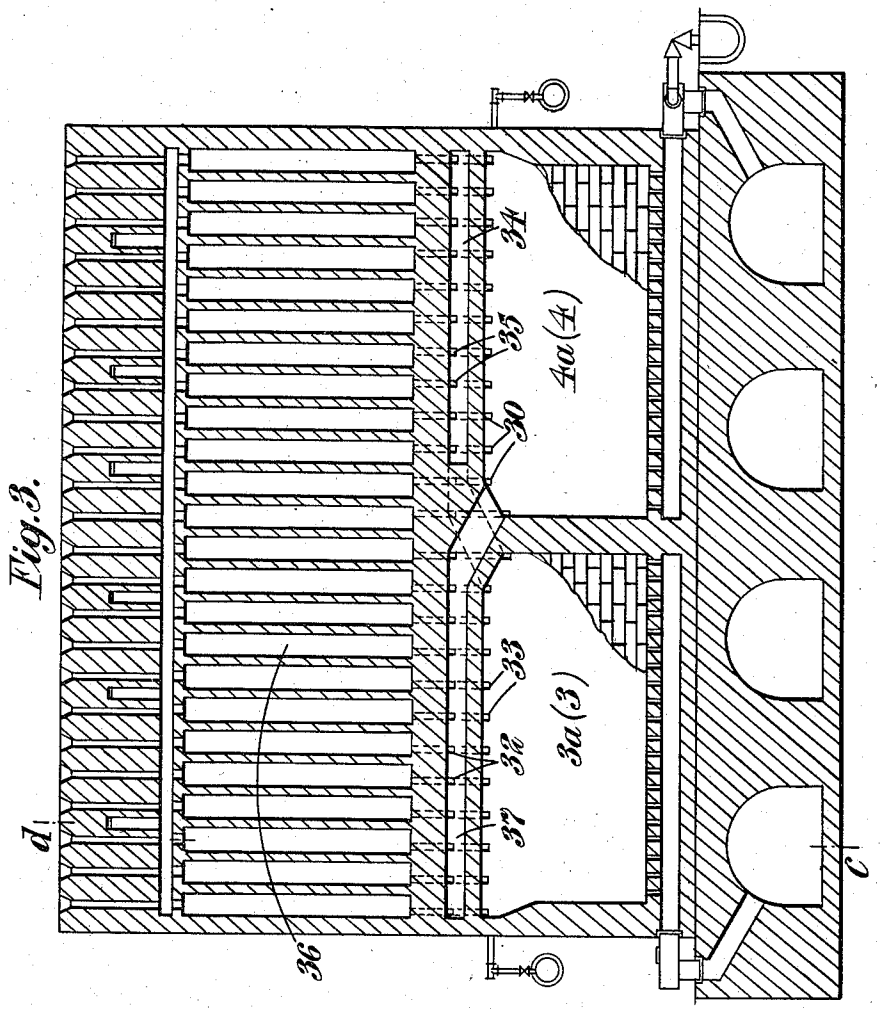
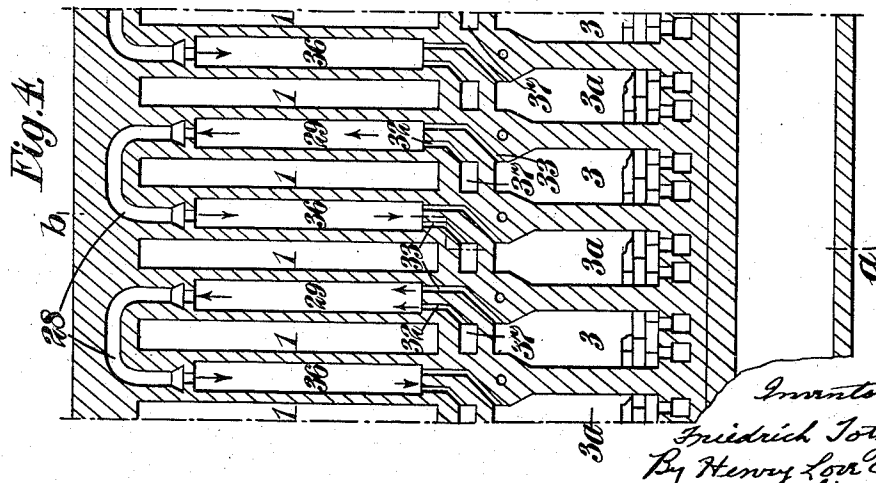


Fig. 4.



Inventor
Friedrich Totzek
By Henry Lowe Clarke
his atty.

Patented Jan. 8, 1935 1,986,903

UNITED STATES PATENT OFFICE

1,986,903

COKE OVEN

Friedrich Totzek, Essen-Stoppenberg, Germany, assignor, by mesne assignments, to The Koppers Company of Delaware, Pittsburgh, Pa., a corporation of Delaware

Application January 16, 1931, Serial No. 509,085
In Germany August 31, 1928

7 Claims. (Cl. 202—143)

The present invention consists of improvements in or relating to regenerative coke ovens for the production of gas and coke, and relates to the type of oven having pairs of regenerator chambers underneath the oven chambers, each pair of regenerator chambers being divided by a central transverse wall.

According to one feature of the invention, a regenerative coke oven comprises a pair of regenerators situated on opposite sides of a central wall transverse to the length of an oven chamber, an extension passageway extending from each regenerator over the companion regenerator, and vertical heating flues each communicating with one of said regenerators and also, through the extension passageway, with the companion regenerator.

The invention may be embodied as a modification of the oven described in U. S. patent application Serial No. 316,975 of Friedrich Totzek. That application describes a regenerative coke oven having pairs of heating flues communicating so that gas flows upwardly in one flue and downwardly in the other and connected so that one flue communicates with one regenerator and the other flue with the companion regenerator. Thus, one regenerator will serve to preheat, while the companion regenerator is being heated by exhaust gases. Each regenerator serves flues of two walls, and each wall is served by two pairs of regenerators. Thus, the heating flues of a particular wall, receive preheated air from one regenerator, and pre-heated lean gas from a neighbouring regenerator, while the two companion regenerators receive exhaust gas from the exhaust flues of the wall. In the construction described in the specification referred to, each regenerator is connected directly to flues in that half of the heating wall situated above it, and is provided with an extension passage extending over the companion regenerator and communicating with flues in the half of the wall over said companion regenerator. Thus, an extension passage will be carrying exhaust gases, while a regenerator situated beneath it will be carrying lean gas or air or vice versa. By means of the present invention, either the extension passage and the regenerator below it are both carrying the exhaust gases, or else one is carrying air, while the other is carrying lean gas. In this way there is never any substantial pressure difference between the contents of an extension passageway and the regenerator beneath it.

In the construction to be described, lean gas and air are respectively supplied to one pair of regenerators, while exhaust gases serve to preheat both of a neighbouring pair of regenerators. Although this entails the situation of regenerators which are pre-heating and regenerators which are being heated next to one another in the direction of the battery axis, which was avoided in the prior specification referred to, the construction, according to the present invention, provides regenerators of sufficient size to pass the requisite quantity of gas and separated from one another by supporting walls of adequate thickness, which is of particular importance in an oven employing preheated lean gas.

Since, according to the present invention, there is no substantial pressure difference between an extension passageway and the regenerator beneath it, on providing expansion joints in the direction of the chamber axis in the above block, only those channels will be cut which are at substantially the same pressure so that no loss of heating gas will occur through leakages into passages carrying exhaust gases.

The invention may also be applied as a modification of the so called Becker oven described in U. S. patent application, Serial No. 317,072 of Ernst Leyh (now Patent No. 1,802,518), in which pairs of vertical heating flues are employed whereof one flue is in a wall on one side of an oven chamber, while the other flue is in a wall on the other side of the chamber.

In the construction illustrated, rich gases may be supplied in the manner peculiar to the known Koppers oven by arranging the rich gas passage below an oven sole. Alternatively, the rich gas may be supplied directly from underfeed burners as in the known Otto ovens which are supported on cellars without departing from the invention.

In order that the invention may be more readily understood, a specific example thereof will now be described with reference to the accompanying drawings, in which,

Figure 1 is a longitudinal section on the line *a—b* of Figure 2 through a heating wall and pair of regenerators of an oven of the Totzek type.

Figure 2 is a section on the line *c—d* of Figure 1,

Figure 3 is a section similar to Figure 1 through an oven of the Becker cross-over type exemplified in Patent 1,374,546, and

Figure 4 is a section similar to Figure 2 of the oven shown in Figure 3.

Like reference numerals indicate like parts throughout the figures.

As shown in Figures 1 and 2, the oven chambers 1 are situated above the regenerator chambers 3, 3*a*, 4 and 4*a*. A pair of regenerators 3

and 4 are separated from one another by a wall 2 transverse to the length of an oven chamber, extending the whole length of the oven battery, while the regenerators 3 and 3*a* of neighbouring pairs are separated by a longitudinal wall 5.

When heating with lean gas, a pair of regenerators will, at any moment, either both serve to pre-heat or both be heated by exhaust gases. Thus, for example, if the regenerator 4 is serving to pre-heat lean gas, the companion regenerator 3, being opposite it, will serve to pre-heat air, while the regenerators 3*a* and 4*a* separated from them by the gas tight supporting walls 5, will both be heated by exhaust gases.

The air for the regenerators is supplied from reversing members 7 through sole channels 6, always from one side of the oven, in the case of the construction illustrated from the left hand side, while the lean gas to be pre-heated is supplied from the other side, i. e. in this case, from the right hand side, from the lean gas conduit 8, through the reversing member 9 and distributing channel 10.

The heating wall is provided with pairs of flues 11*a* and 11*b*. The two flues of a pair communicate with one another at their upper ends, so that gas can pass up one flue and down the other. Each regenerator is provided with an extension passage passing scissorwise the corresponding extension passage of the companion regenerator and lying above said companion regenerator. Thus the regenerators 4 and 4*a* are provided respectively with extension passages 14 and 25 lying above the regenerators 3 and 3*a* respectively, while the regenerators 3 and 3*a* are provided respectively with extension passages 16 and 26 lying above the regenerators 4 and 4*a* respectively.

Each of the vertical flues 11*a* in the left hand half of the wall as shown in Figure 1, communicates directly with a regenerator 3 through passages 15 and also through passages 13 and the extension passage 14 with a regenerator 4. Similarly the passages 11*a* in the right-hand half of the wall also communicate with both regenerators 3 and 4 by means respectively of passages 17 and the extension 16 and direct passages 12. Similarly each of the flues 11*b* communicates with a pair of regenerators 3*a* and 4*a* situated (in Figure 1) behind the regenerators 3 and 4. Thus, in the left-hand half of the wall, flues 11*b* communicate with regenerator 3*a* directly through passages 18 and with regenerator 4*a* through the passages 19 and the extension passage 25, while the flues 10*b* in the right-hand half of the wall communicate directly with regenerator 4*a* through passages 20 and with regenerator 3*a* through passages 21 and extension passage 26. Thus, air from the regenerator 3 meets gas from the regenerator 4 in the bottom of a heating flue 11*a*, and the products of combustion pass out from the bottom of the companion flue 11*b* into the regenerators 3*a* and 4*a*. After a time, the direction of the draught is reversed, and the gases flow in an opposite direction. After reversal of the reversing members 7 and 9 on the two sides of the oven, the exhaust gases are supplied by the reversing members to the exhaust channels 27 through the regenerator sole channels 6*a* and 10*a*.

On heating the oven with rich gases, air for combustion will pass through both the regenerators 3 and 4, or after reversal both the regenerators 3*a* and 4*a*. The rich gas will then be supplied through supply conduits 22 arranged on either side of the oven battery to the heating flues 11*a* through the channels 23 in one working stage, and in the other working stage to the heating flues 11*b* through the channels 24.

The oven shown in Figures 3 and 4 is, in many respects, similar to that shown in Figures 1 and 2. The chief difference, however, is that of a pair of heating flues 29 and 36, one is in a heating wall on one side of an oven chamber, and the other is in a heating wall on the other side of the oven chamber, and they communicate by means of circulating channels 28 in the oven roof passing over the oven chambers. Thus, in a given heating wall, all the flues have gas flowing either downwardly or upwardly in them.

The supply of gas and air to the flues and the removal of exhaust gases from the flues is effected in the same way, as in the oven described in Figures 1 and 2. In this case, however, there is only one pair of regenerators in communication with each wall. In the left-hand half of Figure 3, the flues 36 communicate directly with the regenerator 3*a* through passages 33 and also through pasages 32 and an extension passage 37 with the regenerator 4*a*. In the right-hand half of the wall the flues 36 communicate directly through passages 30 with the regenerator 4*a* and with the regenerator 3*a* through passages 35 and an extension passage 34. The flues 29 of a neighbouring heating wall communicate similarly with regenerators 3 and 4.

I claim:—

1. A regenerative coke oven comprising, in combination: a series of alternate coking chambers and heating walls therefor arranged laterally of each other in a row; pairs of regenerators situated below the bottoms of the coking chambers and heating walls, the two regenerators of each pair of regenerators being on opposite sides of a wall extending longitudinally of the oven, respectively; an extension passageway extending from each regenerator over the other regenerator of the same pair, each of said heating walls comprising vertical heating flues, the vertical flues of each of said heating walls being communicably connected at their tops with the tops of others of the vertical heating flues of said walls so as to provide two sets of vertical flues operable for concurrent inflow combustion and outflow of waste gas in alternation with each other along the portions of the coking chambers on opposite sides of said division wall; each individual flue of one of the two sets thereof communicating with one regenerator of a pair and through an extension passageway with the other regenerator of the same pair, and each individual flue of the other of the two sets thereof communicating similarly with another of said pairs of regenerators also on opposite sides of the same said division wall.

2. A regenerative coke oven comprising, in combination: a series of alternate coking chambers and heating walls therefor arranged laterally of each other in a row; pairs of regenerators situated below the bottoms of the coking chambers and heating walls, the two regenerators of each pair of regenerators being on opposite sides of a wall extending longitudinally of the oven, respectively; an extension passageway extending from each regenerator over the other regenerator of the same pair; and pairs of vertical flues in each of said heating walls, each pair comprising flues communicably connected with each other for concurrent inflow combustion and outflow of waste

gas in alternation with each other, there being parts of such flues along the portions of the coking chambers on opposite sides of said division wall; one flue of each of the aforesaid pairs thereof communicating with a regenerator and through an extension passageway with the other regenerator of the same pair, and the companion flue communicating similarly with a neighboring pair of regenerators also on opposite sides of the same said division wall.

3. A regenerative coke oven comprising, in combination: a series of alternate coking chambers and heating walls therefor arranged laterally of each other in a row; pairs of regenerators situated below the bottoms of the coking chambers and heating walls, the two regenerators of each pair of regenerators being on opposite sides of a wall extending longitudinally of the oven, respectively; an extension passageway extending from each regenerator over the other regenerator of the same pair; each of said heating walls comprising combustion flues, the flues of each of said heating walls being communicably connected with the flues in another of said heating walls by crossover conduits crossing over the intervening coking chambers so as to provide two sets of heating flues operable for concurrent inflow combustion and outflow of waste gas in alternation with each other along the portions of the coking chambers on opposite sides of said division wall; each flue of one of the two sets thereof communicating with a regenerator and through an extension passageway with the other regenerator of the same pair, and each flue of the other of the two sets thereof communicating similarly with another pair of said regenerators also on opposite sides of the same said division wall.

4. A regenerative coke oven for heating with preheated air and weak gas comprising, in combination: a series of alternate coking chambers and heating walls therefor arranged laterally of each other in a row, each of said heating walls comprising combustion flues; regenerators disposed below the bottoms of the coking chambers and heating walls, said regenerators being operatively disposed in a row of pairs longitudinally of the oven, the two regenerators of each pair of regenerators being on opposite sides of a central wall extending longitudinally of the oven, respectively; each of said combustion flues being communicably connected with both of the regenerators of some one of the pairs of regenerators; one regenerator of each pair being connected for preheating air and the other regenerator of the same pair being connected for preheating fuel gas simultaneously therewith for delivery to the same combustion flue; and supply connections arranged to supply air and lean gas respectively to the two regenerators of a pair and for concurrently removing exhaust gases from both of a neighboring pair of regenerators also on opposite sides of the same said division wall.

5. A regenerative coke oven for heating with preheated air and weak gas comprising, in combination: a series of alternate coking chambers and heating walls therefor arranged laterally of each other in a row, each of said heating walls comprising vertical flues in them; regenerators disposed below the bottoms of the coking chambers and heating walls, and operatively disposed in a row of pairs longitudinally of the oven, the two regenerators of each pair of regenerators being on opposite sides of a central wall extending longitudinally of the oven, respectively; passages from each regenerator communicating directly with heating flues in the half of a heating wall in the portion of the oven on the same side of said central wall as the regenerator; an extension passageway from the upper inner end of each regenerator passing scissorwise the corresponding passage of the other regenerator of the same pair and lying above said other regenerator; passages from said extension passageway to the flues in the half of a heating wall lying in the portion of the oven on the same side of said central wall as said other regenerator of the same pair; one regenerator of each pair being connected for preheating air and the other regenerator of the same pair being connected for preheating fuel gas simultaneously therewith for delivery to the same combustion flues and supply connections arranged to supply air to one regenerator and gas to the other regenerator of the same pair and for concurrently removing exhaust gas from both of a neighboring pair of regenerators also on opposite sides of the same said division wall.

6. A regenerative coke oven comprising, in combination: a series of alternate coking chambers and heating walls therefor arranged laterally of each other in a row, each of said heating walls comprising pairs of vertical combustion flues, each pair comprising flues communicably connected with each other for concurrent inflow combustion and outflow of waste gas in alternation with each other; pairs of regenerators situated below the bottoms of the coking chambers and heating walls, the two regenerators of each pair of regenerators being on opposite sides of a wall extending longitudinally of the oven, respectively; one regenerator of each pair being connected for preheating air and the other regenerator of the same pair being connected for preheating fuel gas simultaneously therewith for delivery to the same combustion flue of each of the pairs of flues in both of two adjacent heating walls.

7. A regenerative coke oven comprising in combination: a series of alternate coking chambers and heating walls therefor arranged laterally of each other in a row, each of said heating walls comprising pairs of vertical combustion flues, each pair comprising flues communicably connected with each other for concurrent inflow combustion and outflow of waste gas in alternation with each other; pairs of regenerators situated below the bottoms of the coking chambers and heating walls, the two regenerators of each pair of regenerators being on opposite sides of a wall extending longitudinally of the oven, respectively; and passages connecting both of a pair of regenerators to one flue of each of the pairs of flues in both of two adjacent heating walls; and other passages connecting the remaining flues in one of said walls to both of another pair of said regenerators which are also on opposite sides of the same said central division wall and which also communicate with one flue of each pair of flues in a third heating wall adjacent to said two adjacent heating walls.

FRIEDRICH TOTZEK.