June 3, 1930. E. LECOCQ 1,761,835

COKE OVEN

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Fig. 1.

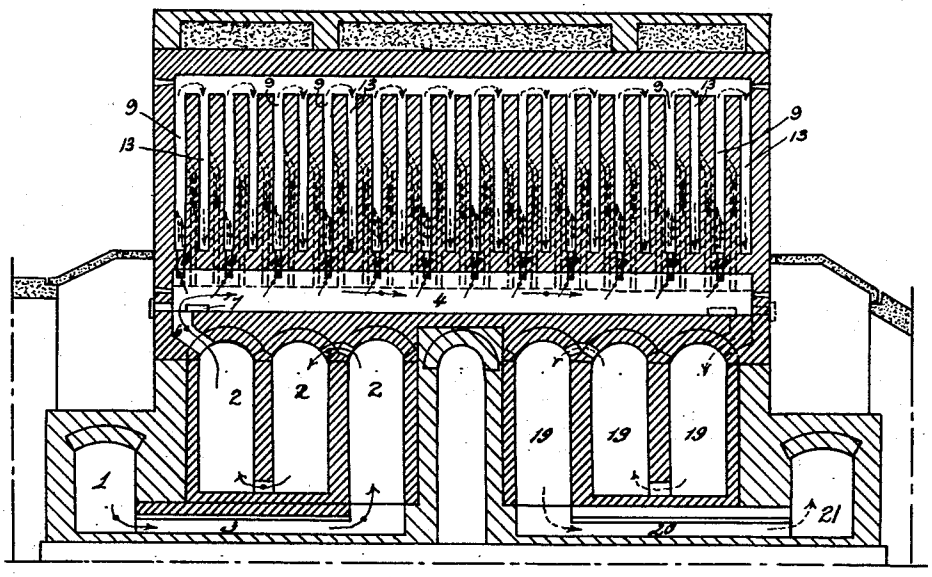
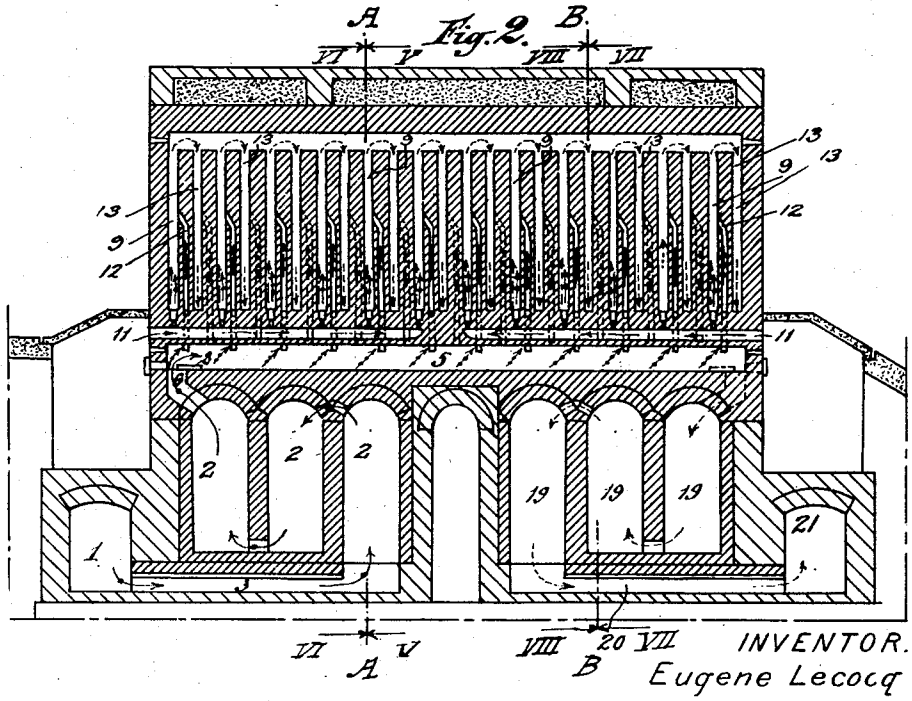


Fig. 2.



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COKE OVEN

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Fig. 3.

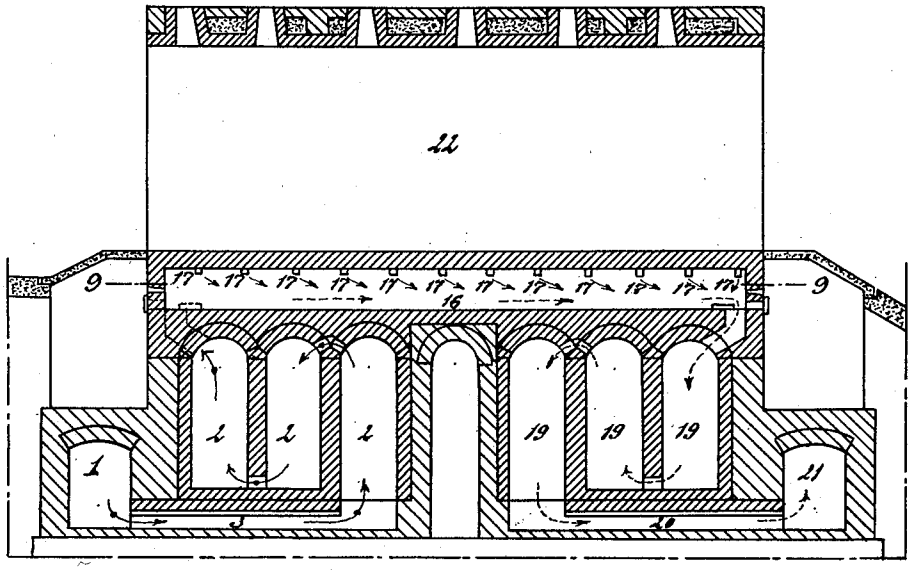
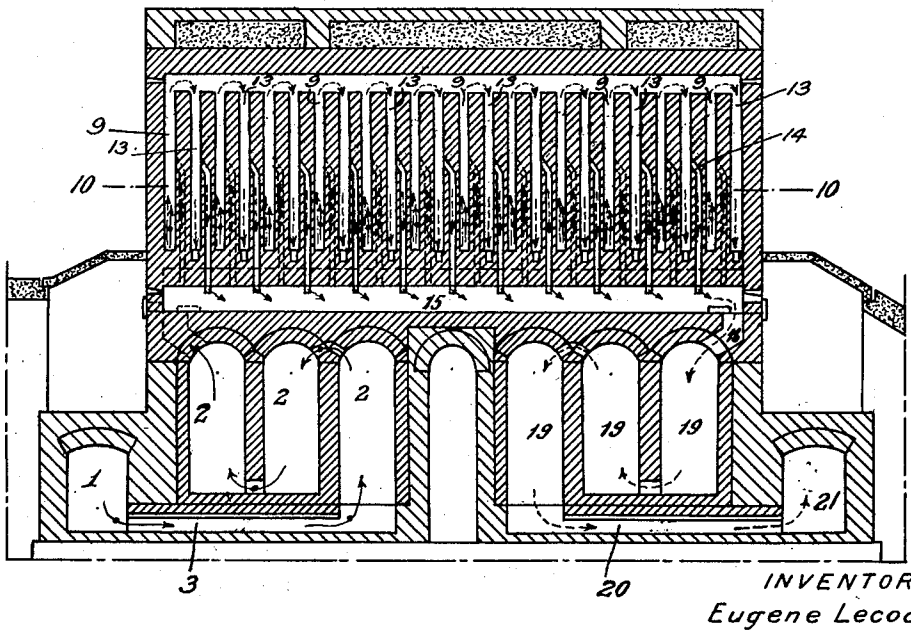


Fig. 4.



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June 3, 1930. E. LECOCQ 1,761,835

COKE OVEN

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Fig. 5.

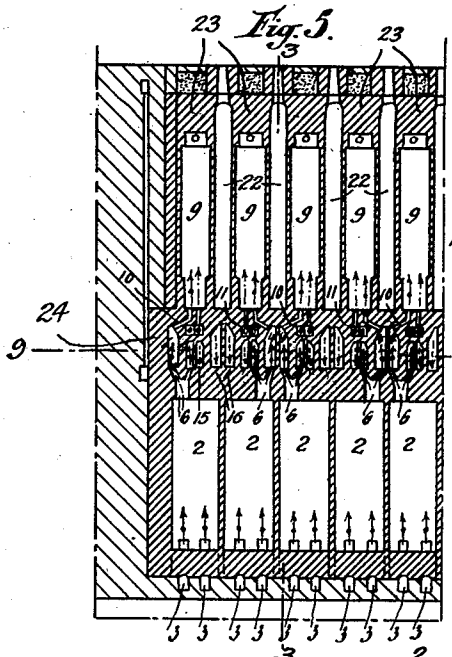


Fig. 6.

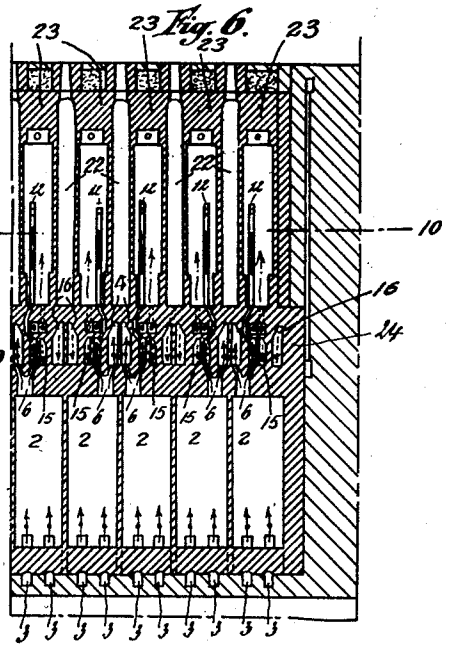


Fig. 7.

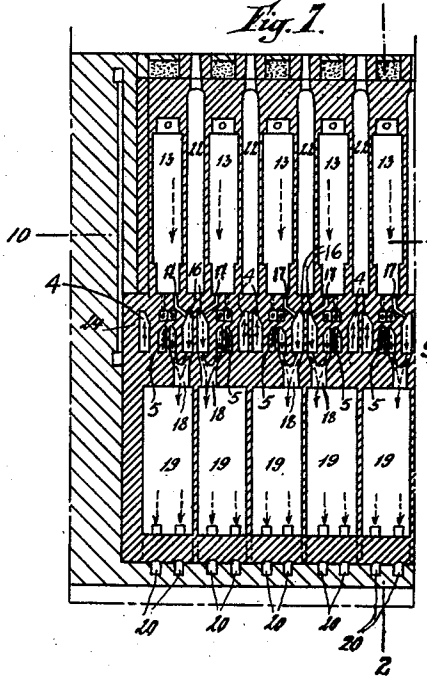
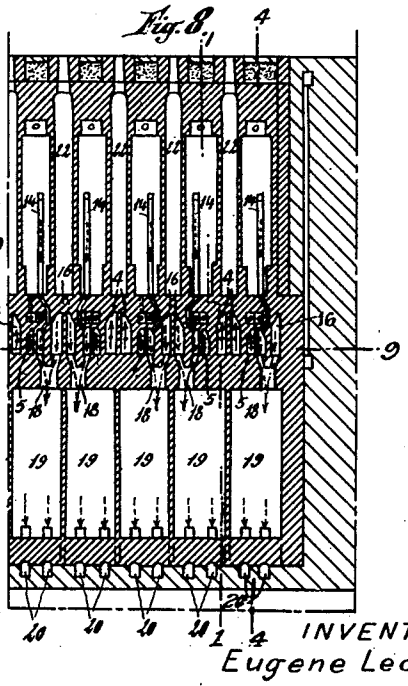


Fig. 8.



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COKE OVEN

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Fig. 9.

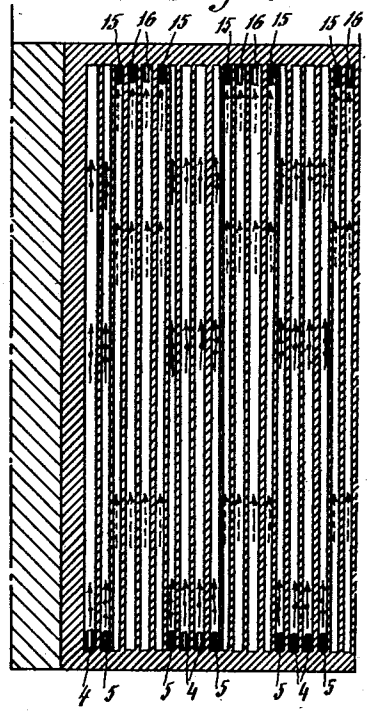
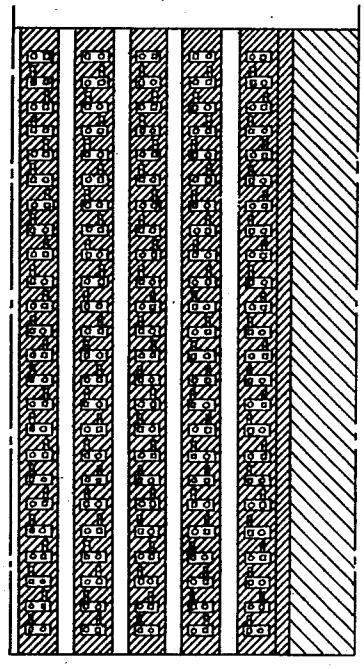


Fig. 10.



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Patented June 3, 1930 1,761,835

UNITED STATES PATENT OFFICE

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COKE OVEN

Application filed March 23, 1925, Serial No. 17,480, and in Belgium March 29, 1924.

It has been known for a long time in connection with coke ovens that when the path taken by the gas during combustion in the heating flues is relatively long, it is necessary to either admit the air, or the gas, or both, at many points in the flues so as to obtain a regular and uniform heat in the oven.

This process is applicable to many metallurgical ovens and also to ovens for distillation of coal as well as for the manufacture of gas for illuminating purposes and in coke ovens.

In these latter the stepped combustion that is to say the admission of gas or air, or both at the same time, at different heights in the heating flues is necessary if the coke ovens are of the type with vertical combustion chambers and also in coke ovens of the type with horizontal chambers and horizontal heating flues owing to the great length of these flues.

In coke ovens with horizontal chambers and vertical heating flues different arrangements are also used for the distribution of air or gas or both at different heights in the heating flues. So, for instance, in certain ovens, the gas is partly admitted at the base of the heating flues and partly at the top of these flues and in others a third admission of gas is made by a horizontal flue under the chamber of the oven; further in other ovens, the whole of the gas is admitted at the base of the heating flues whilst a part only of the air (the primary) necessary for combustion is admitted at that point, the other part (secondary air) being admitted at the upper part of the flues or at a certain height in the flues.

Whatever the arrangement employed, the admission at least of the air at different heights in the flues in controlled quantities has never been done in a satisfactory manner and for this reason most builders of coke ovens with horizontal combustion chambers and vertical heating flues prefer the arrangement consisting in admitting all the gas and air at the base of the heating flues striving by a rational distribution of the two fluids to ensure a uniform distribution of the heat along the whole length of the heating flues which is rendered possible owing to the short length of these flues.

For some time coke ovens of very large sizes have been made having vertical heating flues which for the same reason are of great length.

It is difficult in this new type of oven to obtain a regular heat throughout the whole length of the flues by a single admission of gas and air at their lower end and it becomes necessary to divide up the combustion stage that is to say, the admission of air or gas at different heights in the flues.

The object of the present invention, in a coke oven of great height in which the necessary air for combustion is admitted into the vertical heating flues at two stages, is to provide means for controlling the quantity of air admitted at these stages.

This result is obtained according to the present invention owing to the fact that the entry of the primary air as well as the secondary is made through separate distribution conduits communicating with the flues in the heating walls by two hearth flues extending the whole length of the oven and each connected to regenerators situated at one side of a central line through the battery by a passage controlled by a damper easily accessible, whilst the burnt gases exhausted at different heights in the flues of the heating walls escape together through two flues in the hearth through regenerators at the other side of the battery. Under these conditions the primary and secondary air, on leaving the regenerators forms two independent circuits and the oven hearth has four parallel flues for each heating wall separated throughout their length, each provided with a damper to control the admission of air, and two of which are in communication with the regenerators which are in the process of being cooled and two in communication with the regenerators being heated.

In carrying out the invention one of these flues in this hearth provides primary air at the base of the flues in the heating wall where it mixes in predetermined quantity,

with the total quantity of combustible gas entering through the gas inlet, whilst the other supplies secondary air, also in predetermined quantity, to conduits formed in the walls separating the flues of the heating walls, and having an outlet midway up these flues, the burnt gases being partly exhausted through conduits formed in the walls separating the flues in the heating walls, into a third flue in the hearth and partly at the base of the flues in the heating walls into a fourth flue in the hearth.

The accompanying drawings show as an example one form of the invention in which:

Fig. 1 is a vertical section through the heating walls, the primary air flues in the hearth, the group of regenerators and the collecting galleries.

Fig. 2 is a vertical section through the heating walls on line 2—2 of Fig. 7, the gas distribution flues, the secondary air flues in the hearth, the group of regenerators and the collecting galleries.

Fig. 3 is a vertical section on line 3—3 of Fig. 5 through the carbonizing chamber and the flues in the hearth for the burnt gases communicating with the base of the flues in the heating walls.

Fig. 4 is a vertical section on line 4—4 of Fig. 8 through the heating walls and shows means of escape for part of the burnt gases midway between the flues in the heating walls and the flues in the hearth which before the reversing of the direction of flow of the gases were traversed by the secondary air, the other part of the burnt gases being exhausted at the base of the flues in the heating walls through the hearth which before the reversing was traversed by the primary air.

Fig. 5 is a vertical longitudinal section on line A—A of Figure 2 looking in the direction of arrows V showing the communication between the air regenerators and the primary and secondary air flues in the hearth as well as the passage of the combustible gas and primary air through the flues in the heating walls.

Fig. 6 is a similar view to Fig. 5 on line A—A of Figure 2 looking in the direction of the arrows VI and shows the passage of the secondary air to the flues in the heating walls.

Figs. 7 and 8 are similar views to Figs. 5 and 6 taken on the line B—B looking in the direction of the arrows VII and VIII respectively and show the outlets of the burnt gases from the flues in the hearth to the heat regenerators.

Fig. 9 is a sectional plan on line 9—9 of Figs. 3, 5 and 8 through the group of flues in the hearth showing the circulation of the fluids in the flues.

Fig. 10 is a sectional plan on line 10—10 of Figs. 4, 6 and 7 through the carbonizing chambers and the flues in the heating walls showing the communication between the flues in the heating walls, the flues in the hearth and the gas flues.

The oven shown consists of a series of horizontal parallel carbonization chambers 22 separated by heating walls 23 in which are uptake heating flues 9 alternating with downtake flues 13 for the outlet of the burnt gases. The chambers 22 and the heating walls 23 are separated as usual by a hearth 24 from two groups of regenerators 2 and 19 arranged at each side of a longitudinal line through the battery and communicating through flues 3 and 20 with the collecting galleries 1 and 21.

According to the invention, the hearth 24 of each chamber is provided with four parallel flues 4, 5, 15 and 16 in communication in pairs through the ducts 6 and 18 (provided with dampers 7 and 8) with regenerators 2 and 19. Above the flues 5 and 15 are arranged two gas inlets 11 from which the gas passes alternately to the bottom of the flues 9 in the heating walls or to the bottom of the flues 13.

The primary air is admitted to the base of the heating walls through ducts 10 communicating with the flues 4 and the secondary air is admitted midway up the flues 9 through ducts 12 communicating with the flues 5 formed in the walls separating the heating walls.

In the drawing the entry of the primary air is shown by the arrows marked with a dot and the entry of secondary air by arrows marked with two dots. The entry of the gas is shown by plain arrows formed of long and short dots and the burnt gases by dotted arrows.

This oven operates in the following manner:

Air circulating in the collecting galleries 1 penetrates into the regenerators 2 being cooled through the flues 3; from the regenerator the air passes along the primary air flues 4 and through the duct 6 into the secondary air flues 5. The total quantity of primary and secondary air necessary for each heating wall in order that the oven walls may all be at a uniform heat is controlled exactly by means of dampers 7 and 8 easily accessible from the inspection galleries. The primary air flues 4 in the hearth communicate with the bottom of the upright flues 9 in the heating walls through flues 10 where a part of the gas issuing into the flues 9 from the gas inlets 11 is burnt.

The secondary air to the hearth flues 5 is admitted midway up the flues 9 through conduits 12 formed in the walls, separating the flues in the heating walls. The combustion of the heating gas being completed in the downtake flues 13 in the heating walls,

a part of the burnt gases passes in conduits 14 similar to the conduits 12 communicating with the hearth flues 15. The rest of the burnt gases is exhausted through the hearth 16 which is in communication with the bottom of the flues 13 of the heating walls through conduits 17; the flues in the hearths 15 and 16 are in communication with the regenerators through the flues 20 pass through the collecting gallery 21 on their way to the chimney.

After reversal in the direction of flow of the gases the flues 15 and 16 are respectively traversed by the secondary air and the primary air whilst the flues 4 and 5, the regenerators 2 and the collecting galleries 1 are traversed by the burnt gases. It will be seen that owing to the flues 4, 5, 15 and 16 being independent and the admission of air into these flues controlled by dampers 7 and 8, the quantity of primary and secondary air admitted to the heating flues in the heating walls can be controlled in spite of the admission to the flues occurring at different places.

What I claim is:

1. In a coke oven, a series of alternate carbonization chambers and heating walls therefor arranged side by side in a row, each of said heating walls containing a row of vertical combustion flues communicably connected together in pairs of contiguous flues at the tops thereof, the alternate combustion flues in each of said heating walls constituting alternate flues and the other combustion flues constituting intermediate flues, a pair of horizontal primary bus flues extending beneath each of said carbonization chambers and parallel to said heating walls, the alternate pairs of horizontal primary bus flues communicating with said alternate flues at the bottoms thereof and the intermediate pairs of horizontal primary bus flues communicating with said intermediate flues at the bottoms thereof, a pair of horizontal secondary bus flues extending beneath each of said heating walls and parallel thereto, one of the members of each of the pairs of secondary bus flues communicating with said alternate flues approximately midway the tops and bottoms thereof, the other member of each of the pairs of secondary bus flues communicating with said intermediate flues approximately midway the tops and bottoms thereof, fuel-gas ducts beneath said series communicating with said alternate flues at the bottoms thereof, and other fuel-gas ducts beneath said series communicating with said intermediate flues at the bottoms thereof.

2. In a coke oven, a series of alternate carbonization chambers and heating walls therefor arranged side by side in a row, each of said heating walls containing a row of vertical combustion flues communicably connected together in pairs of contiguous flues at the tops thereof, the alternate combustion flues in each of said heating walls constituting alternate flues and the other combustion flues constituting intermediate flues, a pair of horizontal primary bus flues extending beneath each of said carbonization chambers and parallel to said heating walls, the alternate pairs of horizontal primary bus flues communicating with said alternate flues at the bottoms thereof and the intermediate pairs of horizontal primary bus flues communicating with said intermediate flues at the bottoms thereof, a pair of horizontal secondary bus flues extending beneath each of said heating walls and parallel thereto, one of the members of each of the pairs of secondary bus flues communicating with said alternate flues approximately midway the tops and bottoms thereof, the other member of each of the pairs of secondary bus flues communicating with said intermediate flues approximately midway the tops and bottoms thereof, fuel-gas ducts beneath said series communicating with said alternate flues at the bottoms thereof, other fuel-gas ducts beneath said series communicating with said intermediate flues at the bottoms thereof, two parallel rows of regenerators beneath said series, each of said rows of regenerators extending longitudinally of said series, each of said regenerators communicating with one of said primary bus flues and also communicating with the secondary bus flue which communicates with the same combustion flues with which said one of said primary bue flues communicates.

In testimony whereof I have signed my name to this specification.

EUGÈNE LECOCQ.