E. J. CROSSEN.

COKE OVEN.

APPLICATION FILED SEPT. 25, 1915.

1,227,518. Patented May 22, 1917.

2 SHEETS—SHEET 1.

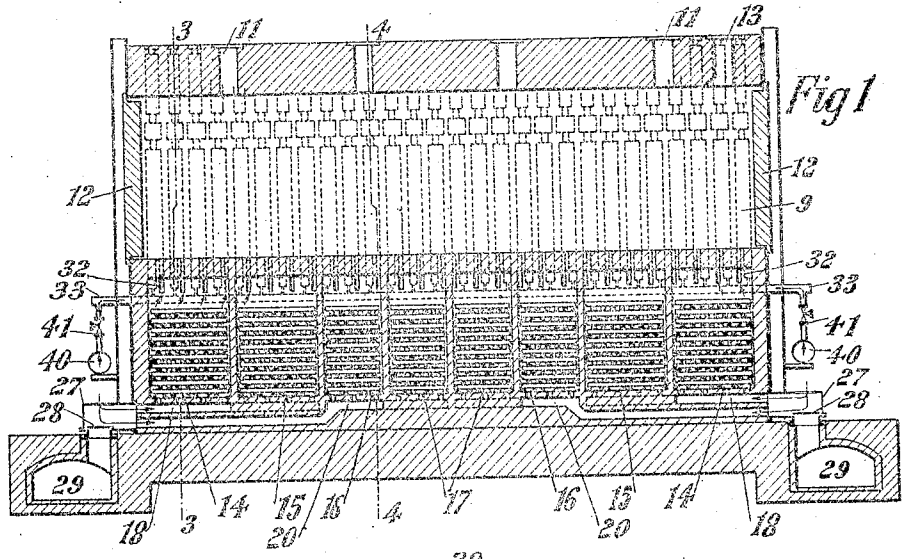


Fig 1

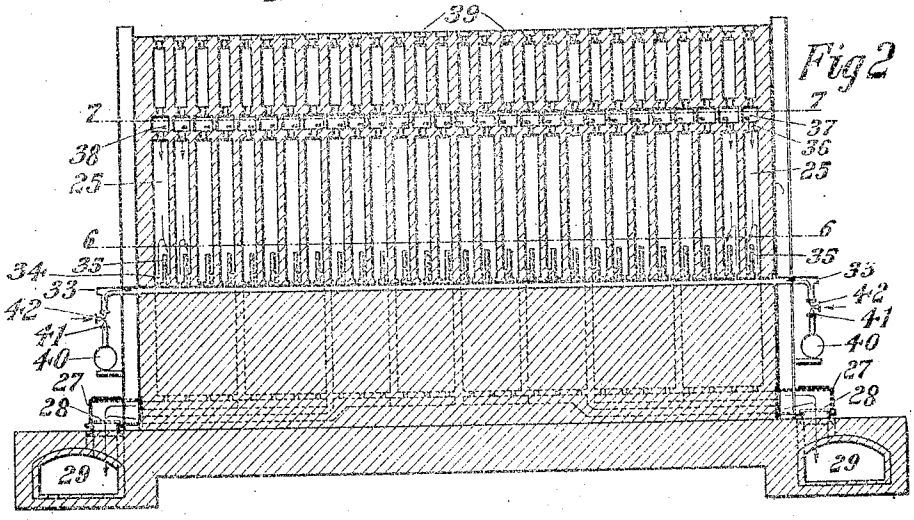


Fig 2

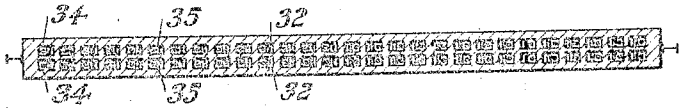


Fig 6

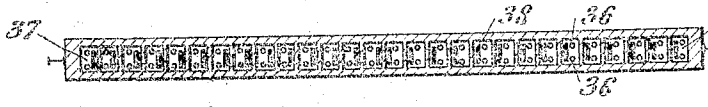


Fig 7

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2 SHEETS—SHEET 2.

Fig 5

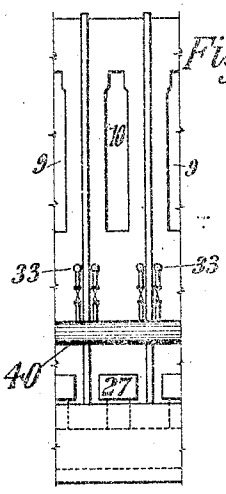


Fig 3

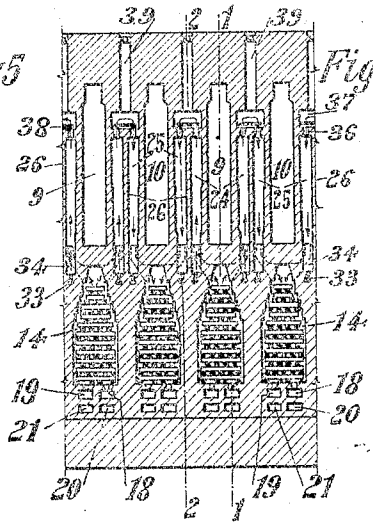


Fig 4

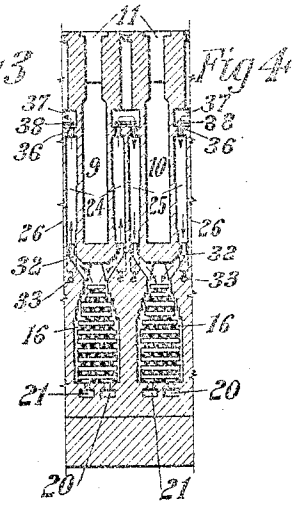
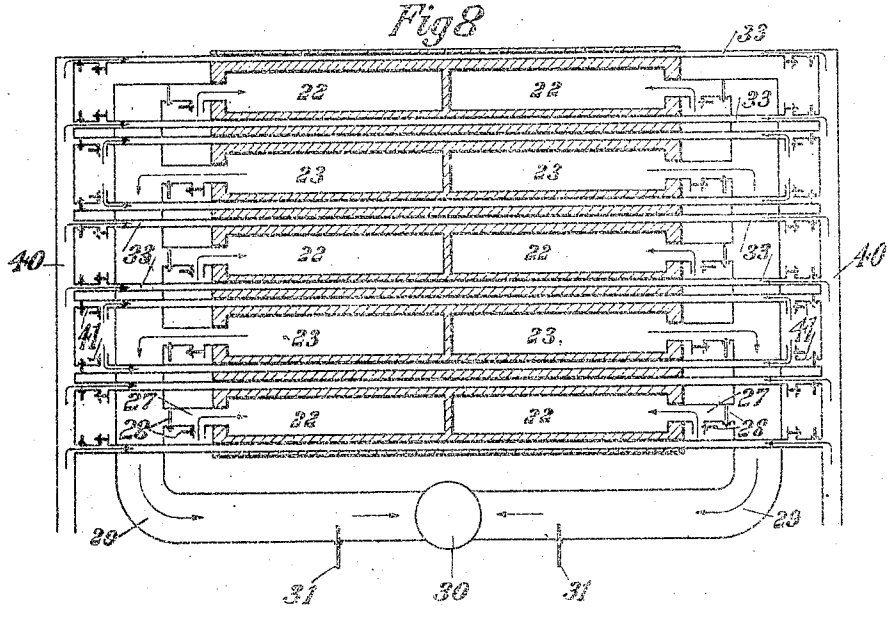


Fig 8



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ELMER J. CROSSEN, OF JOLIET, ILLINOIS.

COKE-OVEN.

1,227,518. Specification of Letters Patent. Patented May 22, 1917.

Application filed September 25, 1915. Serial No. 52,591.

To all whom it may concern:

Be it known that I, ELMER J. CROSSEN, a citizen of the United States, residing in Joliet, in the county of Will and State of Illinois, have invented a certain new and useful Improvement in Coke-Ovens, of which the following is a specification.

This invention relates to structures for producing coke in which the coke ovens are long narrow chambers, vertically arranged, with provisions at their upper parts for charging them with coal or material to be coked and provisions at their ends for discharging the coke. The structure of this invention includes a number of such coke ovens suitably spaced apart; vertical combustion chambers, divided into a number of sections located between the ovens and adjoining the side walls, the laterally adjoining sections between the walls of adjacent ovens being connected together by suitable passages at their upper ends; regenerator heaters located beneath the ovens and divided into a number of sections, alternate regenerators being heated by the products of combustion of the fuel passing from some of the combustion chambers, while the other regenerators, previously so heated, are imparting heat to air supplied to the other combustion chambers; gaseous fuel supply pipes and gas ports located at the lower part of the combustion chambers; means for alternately directing the gas to the ports of the connected adjacent combustion chambers, whereby the chambers alternately act as downtakes for the products of combustion from the other chambers, to which they are connected, and means adapted to supply air to the chambers acting as down-takes. It also includes means for allowing air to flow alternately to the sections of adjacent regenerators and to open the other regenerators, through which the products of combustion are passing, to waste heat flues. These features with other detail of construction will now be fully described by reference had to the accompanying drawings; in which,

Figure 1 is a longitudinal section through the coke ovens and regenerators, taken on line 1, 1, Fig. 3:

Fig. 2, a longitudinal section through the combustion chambers, taken on line 2, 2, Fig. 3:

Fig. 3, a transverse section, on line 3, 3, Fig. 1:

Fig. 4, a transverse section on line 4, 4, Fig. 1:

Fig. 5, an end elevation of a portion of the structure:

Fig. 6, a horizontal section through the lower parts of adjacent combustion chambers, taken on line 6, 6, Fig. 2:

Fig. 7, a similar view, on line 7, 7, Fig. 2, through the upper connecting passages of said combustion chambers: and

Fig. 8 is a general plan of the structure, diagrammatically showing the flow of the gas, air, etc.

The drawings illustrate a structure designed to suitably embody the novel features of this invention. The coke ovens are long chambers whose vertical dimensions greatly exceed their horizontal lateral dimensions. They are all alike but are alternately designated by 9 and 10 to facilitate description. Each is provided with a number of top openings 11 through which the coal to be coked is passed so as to uniformly fill the ovens. Their ends are closed by doors 12, suitably luted, during the coking operation, and each one has an upper opening 13 for the discharge of the volatile and gaseous constituents of the coal. Regenerators, of ordinary checker brick construction, are located beneath the ovens. Each regenerator is preferably divided into two parts the dividing walls of which are laterally centrally located relative to the ovens. Each part is divided into a suitable number of sections that decrease in size from the ends of the ovens toward their centers to provide for uniform distribution of air which is supplied to them from the outer ends of each series of sections. Four such sections are shown, indicated by 14, 15, 16 and 17, each section having a separate air duct indicated respectively by 18, 19, 20 and 21. The regenerators, as units extending under the ovens, are alternately marked 22, 23, on the operative illustration Fig. 8, which will be referred to hereafter. Occupying the spaces between the ovens 9 and 10 are sets of nar-

row vertical combustion chambers 24 and 25 separated by vertical walls 26. Those marked 24 adjoin and cover the side walls of ovens 9 and those marked 25 adjoin and cover the side walls of ovens 10. The outer ends of each set of air ducts 18, 19, 20 and 21 open into a valve box 27, which is provided with a valve 28 adapted to close the air entrance to said box and also to close an outlet from the box to a waste heat flue 29 when the air entrance is open. There is thus a free and unobstructed flow of air through all of the air ducts or passages to the separate regenerators, said passages being open through the valve boxes directly to the atmosphere at both sides of the structure. The waste heat flues 29 located at the ends of the structure connect with a stack 30, the draft of which acts to cause the proper flow of the air to and the products of combustion from the structure. The flues 29 are provided with gates or dampers 31 to regulate the flow of gases through the structure. At the upper end of each of the sections of the regenerators are ports 32 extending in both directions and opening into the lower ends of a suitable number of the narrow combustion chambers at the two sides of the oven above the regenerator.

A gas pipe 33 is located beneath each set of combustion chambers adjoining each of the side walls of the ovens, and from these pipes ports 34 open into the chambers adjacent the air ports 32. Between the ports 32 and 34 are walls or partitions 35, at the upper ends of which the air and gas commingle in a manner to produce perfect combustion of the gas.

The upper ends of the combustion chambers open through passages or ports 36 into small chambers 37. Each of these chambers 37 is common to a combustion chamber of each of the series 24 and 25 that laterally adjoin, the arrangement being such that when the combustion of fuel is occurring in one of the chambers, to heat its adjoining oven, the other is acting as a down-take to impart the heat of the products of combustion to the side wall of its adjoining oven.

Means are provided for governing the flow of gases, etc. through the combustion chambers, shown as consisting of flat bricks 38 in the chambers 37 adapted to be set, by means of a suitable implement operated through openings 39 extending to the top of the structure, to more or less cover the port passages 36.

The gas pipes 33 are connected at their outer ends to a gas main 40, and each is provided with a cut-off valve 41. To insure a uniform supply of gas to all of the combustion chambers, particularly when the coke ovens are of considerable length, it is proposed to provide each end of the structure with a gas main 40 so as to supply gas to the two outer ends of the pipes 33. To open the gas pipes to the atmosphere, when the gas is shut off, cocks or valves of a three-way construction may be employed. Such valves are conventionally illustrated in the drawings, 42 designating the air inlets through which fresh air will pass to the pipes 33 and to the lower parts of the combustion chambers 24 and 25 through the ports 34. This supply of air to the lower parts of the combustion chambers takes place when the chambers are acting as down-takes for their adjoining chambers and the products of combustion are passing to the regenerators. The object and effect of this supply of cool air is to prevent over-heating of the part of the chambers where the gas enters to such an extent as would cause carbon deposition from the fresh inflowing gas, when the chambers are acting again as combustion chambers, and also to keep said ports clear and free by blowing therefrom any deposit that would tend to choke them.

The alternating flow of air, gas and the products of combustion is clearly illustrated in Fig. 8. It being assumed that the coke ovens are in full operation, air is entering the regenerators 22, through the openings in the valve boxes at the same time that gas from the mains is flowing to the combustion chambers adjoining the coke ovens that are above the regenerators 22. The products of combustion from the chambers adjoining the coke ovens above the alternate regenerators 23 are at the same time passing through and heating said regenerators, and therefrom flow by the flues 29, to the stack 30, the valves 28 in the boxes 27 then being set to close the fresh air openings. During this time, which may be about thirty minutes, air is, by the three-way cocks 41, entering the combustion chambers adjoining the ovens above the regenerators 23 as and for the purpose previously described. At the end of the suitable heating period, the valves 28 and 41 are manipulated to reverse the flow through the regenerators, the air then being caused to flow through the heated regenerators 23 and gas to the combustion chambers adjoining the ovens above said regenerators; the products of combustion then flow through the regenerators 22 and raise their temperature to a degree sufficient to adequately heat the inflowing air when the operation is again reversed.

It will be observed that by providing each section of the regenerators with an individual air passage they will receive amounts of air, which is uniformly distributed to them, proportionately to their heating capacities, and to further this advantageous feature it is preferred to reduce the capaci-

ties of the sections as they recede from the air inlets. It will also be observed that by dividing the coke ovens heating means into a number of narrow combustion chambers the supply of gas and air thereto is under perfect control and thereby the consumption of fuel may be reduced to a minimum and the ovens also uniformly heated throughout their length.

I claim—

1. A coke producing structure, comprising a long narrow coke oven, a regenerator heater of substantially the same length as and located directly beneath the oven, a row of combustion chambers vertically arranged along the two longitudinal side walls of the oven, ports extending laterally in both directions from the upper part of the regenerator into the lower ends of the combustion chambers, means for periodically supplying gaseous fuel to all of the combustion chambers at both sides of the oven and means for controlling supply of air to and through the regenerator to all of the combustion chambers.

2. A coke producing structure, comprising a long narrow coke oven, a regenerator heater of substantially the same length as and located directly beneath the oven and divided into individual sections by transverse walls, said sections diminishing in size from the outer to the other end of the regenerator, an independent air passage for each of the sections, a valve box at the outer end of the regenerator to which all of the air passages connect affording direct communication of each passage to the atmosphere, a row of combustion chambers vertically arranged along the two longitudinal side walls of the oven, ports connecting each section of the regenerator to some of the combustion chambers at both sides of the oven and means for supplying gaseous fuel simultaneously to all of the combustion chambers.

3. A coke producing structure, comprising a long narrow coke oven, a regenerator heater of substantially the same length as and located directly beneath the oven and divided into two parts by a centrally located transverse wall, each part being divided into sections of decreasing capacity from the outer to the inner ends, a valve box at each outer end of the regenerator and adapted to be opened to the atmosphere, an independent passage extending from the valve boxes to each of the regenerator sections, combustion chambers arranged along the two longitudinal side walls of the oven, ports connecting the regenerator to all of the combustion chambers and means for supplying a gaseous fuel simultaneously to all of the combustion chambers.

4. A coke producing structure, comprising long narrow coke ovens arranged in parallel order, a regenerator heater the same length as and located directly beneath each oven, and divided into individual sections by transverse walls, an individual air passage for each section, a valve box at the outer end of each regenerator and adapted to be opened to the atmosphere, separate air passages for the sections of the regenerators connecting the sections of each regenerator to its valve box, combustion chambers arranged along the two sides of the ovens, ports connecting the upper part of each regenerator to the combustion chambers of its superimposed oven and means for periodically supplying a gaseous fuel to all of the combustion chambers of alternate ovens.

5. A coke producing structure, comprising a long narrow regenerator divided into individual sections by transverse walls, a separate passage adapted to be opened to the atmosphere for each section of the regenerator, a coke oven located above the regenerator, a series of combustion chambers at each side of the oven and ports connecting each section of the regenerator to some of the combustion chambers.

6. A coke producing structure, comprising a long narrow regenerator divided into individual sections by transverse walls, said sections decreasing in size throughout the length of the regenerator, an air passage for each section, all of said passages being adapted to be opened to the atmosphere at the end of the regenerator at which the largest section is located, a coke oven located above the regenerator, a series of combustion chambers at each side of the oven and ports connecting each section of the regenerator to some of the combustion chambers.

In testimony whereof, I have hereunto subscribed my name.

ELMER J. CROSSEN.

Witnesses:

MARY W. WALLACE,

L. L. BROWNING.