Jan. 13, 1959 C. OTTO 2,868,277

COKE OVEN

Filed April 5, 1956 2 Sheets-Sheet 1

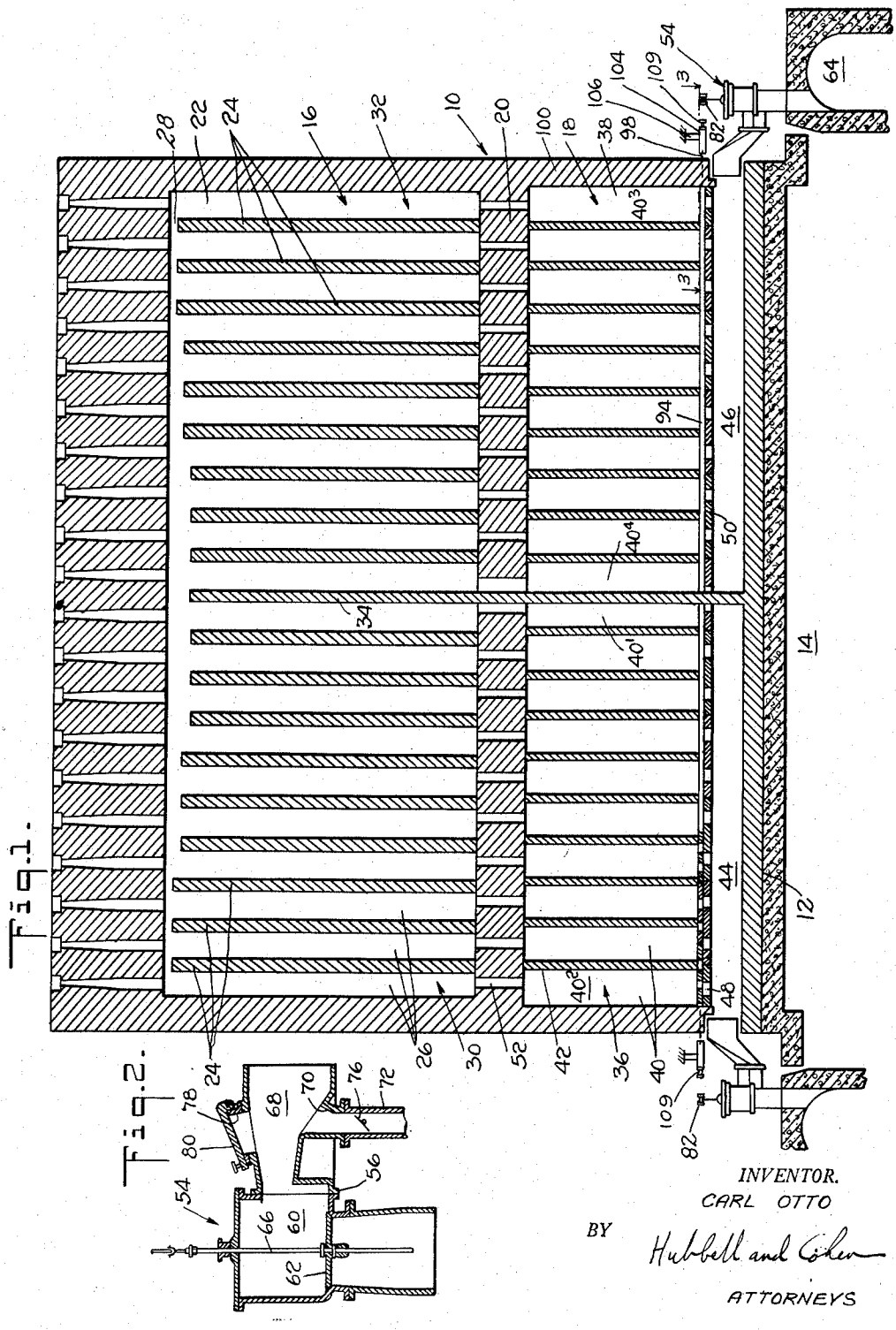


Fig. 1.




Fig. 2.

INVENTOR.
CARL OTTO

BY Hubbell and Cohen

ATTORNEYS

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Fig. 6.

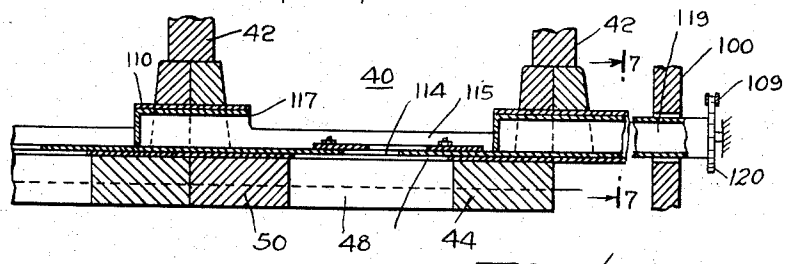



Fig. 7.

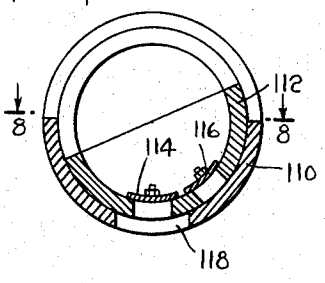



Fig. 4.

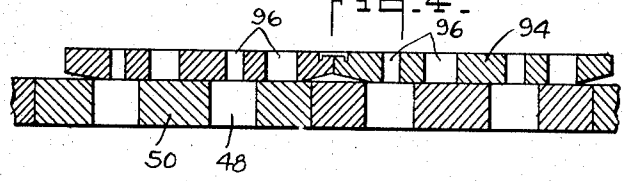



Fig. 5.

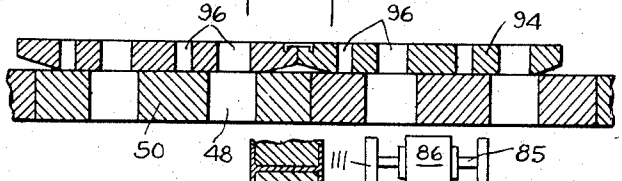



Fig. 3.

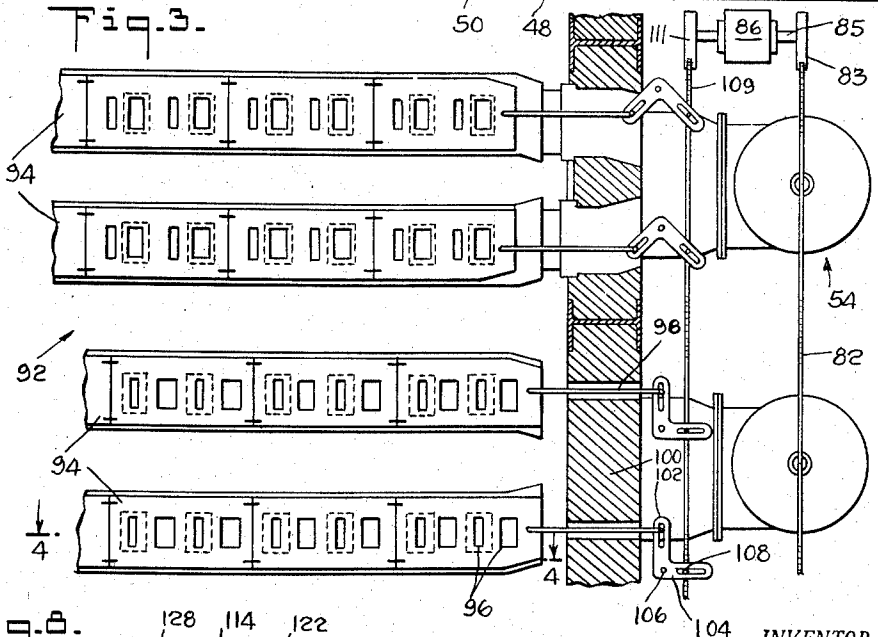
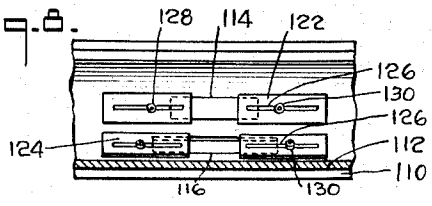



Fig. 8.




INVENTOR.
CARL OTTO

BY Hubbell and Cohen

ATTORNEYS

United States Patent Office 2,868,277 Patented Jan. 13, 1959



2,868,277

# COKE OVEN

Carl Otto, Manhasset, N. Y.

Application April 5, 1956, Serial No. 576,308

7 Claims. (Cl. 158—7.5)

The present invention relates to the construction of a regenerative by-product coke oven battery of the type comprising horizontally elongated coking chambers extending transversely of the battery and alternating with heating walls each of which includes a horizontal row of vertical heating flues, and regenerator chambers below the coking chambers and heating walls and extending transversely of the battery, and characterized by the connection of the upper ends of a plurality of said flues in each heating wall to an upper horizontal channel or bus flue in said wall, and the connection of the lower ends of the heating flues in each heating wall to the upper edges of associated regenerator chambers, and to the connection of the lower edge of each regenerator chamber to a subjacent sole channel by a port opening or passage. Coke oven batteries of the above mentioned type are now used in the production of metallurgical coke and have been for many years past.

In coke ovens of the type described above and particularly in so-called two-divided coke ovens wherein a pair of isolated elongated horizontal sole channels are provided for introducing and removing hot gases from the regenerator, there is a tendency for the gas to unequally distribute itself in the regenerator passages or chambers which are in communication with the sole channels, and therefore to be unequally distributed in the heating flues. This tendency to unequal distribution is due to an appreciable variation in the air or gas pressure in the sole channels along the length of the latter as a result of the variations in linear velocity of flow in the channel at different points along its length.

There have been many attempts to obviate and eliminate the unequal distribution of air or gas in the regenerator passages and in the flues. However, none of the prior attempts has been entirely satisfactory since they are impractical economically or do not give an entirely satisfactory distribution.

It is therefore one object of the present invention to provide improved means for controlling the distribution of combustion agents through coke oven regenerators and heating flues to thereby closely approximate the heating action referred to as "uniform heating."

Another object of the present invention is to provide new and improved means for controlling the distribution of combustion agents flowing through coke oven regenerators and heating flues which yields substantially uniform heating of the coke oven regardless of direction of flow of the combustion agents through the heating flues.

A further object of the present invention is the provision of means for controlling the distribution of combustion agents flowing through the coke oven regenerators and heating flues to provide for uniform heating, which means includes a movable element operatively connected to means for reversing the flow of combustion agents through the coke oven for moving said element between first and second positions in order to effect uniform heating regardless of the direction of flow of the combustion agents through the regenerator.



The above and other objects, characteristics and features of the present invention will be more fully understood from the following description taken in connection with the accompanying illustrative drawings.

In the drawings:

Fig. 1 is a transverse sectional view of a coke oven battery;

Fig. 2 is a longitudinal sectional view of a reversing valve employed in the coke oven shown in Fig. 1;

Fig. 3 is a sectional view taken along the line 3—3 of Fig. 1;

Fig. 4 is a sectional view taken along the line 4—4 of Fig. 3;

Fig. 5 is a sectional view similar to Fig. 4 illustrating my novel control means in another condition;

Fig. 6 illustrates another form of control means embodying the present invention, said control means being shown in longitudinal section;

Fig. 7 is a sectional view taken along the line 7—7 of Fig. 6; and

Fig. 8 is a sectional view taken along the line 8—8 of Fig. 7.

Referring now to the drawings in detail, Fig. 1 illustrates a coke oven battery generally designated by the reference numeral 10. This coke oven battery is of the "two-divided type" although my invention is not necessarily limited to this type of battery. The battery 10 comprises a supporting deck 12 which is preferably made of concrete and may or may not form the roof of a conventional basement space 14. Deck 12 provides a support means for the coke oven brickwork which forms an upper story or section 16 and a lower story or section 18 which merge into an intermediate horizontal masonry layer 20. The upper story or section 16 of the battery comprises horizontally elongated coking chambers (not shown) alternating with heating walls 22. Extending between each two adjacent heating walls 22 are a plurality of flue division walls 24 which divide the upper story or section 16 into a plurality of flues 26. In a two-divided oven of the type shown herein all of the flues 26 are in communication with an upper horizontal channel or bus flue 28 which is preferably of a varying cross section so as to compensate for the varying volumes of gases flowing through different portions of the bus flue.

In a two-divided oven the oven is divided into two substantially symmetrical sections 30 and 32 by a vertical flue division wall 34 which extends from a level substantially even with the tops of the adjacent flue division walls 24 downwardly to deck 12.

The lower story 18 of the battery 10 constitutes a regenerator for preheating combustion air or for preheating a lean fuel gas such as a blast furnace gas. The regenerator is divided by the vertical division wall 34 into two sections 36 and 38 and each of these sections is divided into a plurality of passages or flues 40 by division walls 42. Beneath the regenerator passages or flues 40 and extending between two adjacent walls 22 are two end-to-end sole channels 44 and 46 which are isolated from one another by the wall 34. The regenerator flues or passages 40 communicate with their adjacent sole channel 44 or 46 by means of openings or apertures 48 in the wall 50 defining the upper periphery of the sole channels. As shown herein and as is normally the case, the openings 48 are all substantially the same size. In order to permit for communication between the regenerator passages 40 and the heating flues 26 passages or openings 52 are provided in masonry layer 20.

With the structure hereinbefore described, air or lean gas is introduced into one of the sole channels, for in-

stance channel 44, and said gas passes through the openings 48 into the regenerator passages 40 upwardly through the passages 52 in the masonry layer 20 and upwardly through the flues in the section 30 across through the bus flue 28 and thence downwardly through flues 26 and passages 40 in the right hand section of the coke oven and out through the sole channel 46. At other times the lean gas or air can follow a reverse path.

To introduce air or lean gas mixture into the sole channels reversing valves 54 are provided at the opposite sides of the battery. An example of such a reversing valve is shown in Fig. 2. My present invention is not limited in any manner to the particular construction of the reversing valve and any suitable construction may be used. The valve illustrated in Fig. 2 comprises a housing 56 which defines a chamber 60. A vertically movable damper or valve member 62 is raised and lowered to open and close communication between the chamber 60 and the waste heat tunnel 64 beneath the damper 62. As shown, the valve 62 is a circular disc. The valve 62 is rigidly connected to a vertical valve stem 66 which extends upward through the top of the valve chamber 60 and is operatively connected to reversing mechanism which will be described in detail hereinafter. The chamber 60 is in continuous communication through a conduit connection 68 with an associated sole channel 44 or 46. The housing 56 is provided with an opening 70 for connection with a pipe 72 extending from the conduit connection 68 to a source of gas (not shown). Disposed in the pipe 72 for controlling the flow of gas therethrough is a suitable cut-off valve 76 here shown diagrammatically as a butterfly valve. Housing 56 is also provided with an air inlet port 78. Flow through the air inlet port into the conduit connection 68 is controlled by a pivoted valve member 80. Each of the valves 76 and 80 which are associated with the reversing damper 62 are operatively connected to a reversing valve mechanism arranged to give each of said valve members an opening or closing adjustment respectively at the end of each reversal period. As hereinabove mentioned, the reversing valve mechanism is conventional and forms no part of the present invention and for this reason it is believed that further description thereof is unnecesary.

To operate the reversing valve mechanisms 54 so as to reverse the flow of air or lean gas through the regenerator any suitable mechanism may be employed. As shown herein, a chain 82 is provided. Chain 82 is continuous and preferably extends completely around the outer periphery of the battery. As shown in Fig. 3, chain 82 is fixed to a crank 83 mounted on a shaft 85 for rotation therewith by a motor means 86. Rotation of the crank 83 imparts linear movement to chain 82. It will be obvious that other reversing means may be employed. For instance, a hydraulically actuated reciprocably operable piston would be eminently suitable for this application. The valve stem 66 for the damper 62 is operatively connected to the chain 82 in any suitable manner whereby to effect the upward and downward movement of the damper for reversing the condition of the reversing valve mechanism. It is believed obvious that the two reversing valves 54 shown in Fig. 1 are adapted to operate to opposite conditions whereby one is effective for permitting the passage of waste gas through the valve mechanism and to the exhaust tunnel 64 when the other is effective for introducing air or lean gas into the coke oven.

All that has been described hereinbefore is old and well known to those skilled in the art. The present invention relates to a means for controlling the flow of lean gas and air from the sole channels into the regenerator passages so that the flow will be uniform regardless of the direction thereof. This control means is generally designated by the reference character 92. In accordance with the form of the invention shown in Figs. 1 to 5, the control means comprises a plurality of longitudinally extending members or bars 94, one for each set of flues, which overlie the wall 50 in sliding relationship therewith. The members 94 are made of refractory material or heat resistant metal and are provided with a plurality of pairs of openings 96, each pair being associated with one opening or aperture 48 in the wall 50 extending from the sole channel to the regenerator passage. As hereinbefore mentioned, members 94 are longitudinally movable or slidable and this sliding movement is effective for moving the member 94 to and from first and second positions (Figs. 4 and 5). In a first position one of each pair of apertures or openings 96 in member 94 is in register with its associated opening 48 and in a second position of member 94 the other of each pair of openings 96 is in registry with its associated opening 48.

In accordance with the present invention the openings 96 are not all of the same size but are graduated in size so as to provide for uniform flow of air and lean gas. Assuming that gas or air is introduced into sole channel 44 the natural tendency of said gas or air is to have maximum volume flow upwardly through the passage 40′ and the flow will diminish gradually so that the minimum flow will be through the flue $40_2$. On the exit side of the structure the maximum flow tends to be through the flue $40_3$ and the minimum flow tends to be through flue $40_4$, the distribution of flow being gradually less in accordance with the remoteness of any given flue from flue $40_3$. This analysis may be stated qualitatively in that the volume of air tends to be greatest the farther away a flue is from the entrance end of a sole channel and tends to be greatest the closer to the exit end of a sole channel. To correct this tendency, the apertures in members 94 which are in registry with openings 48 when gas or air is introduced into sole channel 44 are progressively smaller as the aperture is more remote from the reversing valve 54 associated with sole channel 44. Moreover, when gas or air is introduced into sole channel 44 the openings 96 in registry with openings 48 associated with sole channel 46 are progresively larger as they are remote from reversing valve 54 associated with channel 46. Accordingly, it will be seen that the resistance to flow of air or gas from the sole channel 44 upwardly into the passages in the regenerator section 36 is progressively greater as the passage is remote from the reversing valve 54 associated with sole channel 44. This gradual increase in the resistance of flow from sole channel 44 into the passages in regenerator section 36 is exactly enough to compensate for the tendency of the flow to be uneven and to be greatest through the passage 40′. In the regenerator section 38 the same is true. That is, the smallest opening in member 94 is associated with the opening 48 between the flue $40_3$ and sole channel 46 and the largest opening in member 94 is associated with the opening 48 between the sole channel 46 and the regenerator passage $40_4$. In this manner the distribution of air and gas flow through the battery may be equalized.

When the flow is reversed so that gas or air is introduced into sole channel 46 and is withdrawn from the coke oven through the sole channel 44 the exact reverse is true. That is, there is a tendency for maximum flow upwardly to take place in regenerator passage $40_4$ and for a minimum of upward flow to take place through passage $40_3$. Moreover, the downward passage of waste gas through the flues 26 and regenerator passages 40 tends to be unequally distributed so that the maximum flow will be through regenerator passage $40_2$ and the minimum flow will be through regenerator passage $40_1$. Accordingly, members 94 are moved upon reversing of gas flow in a manner to be described subsequently so that the other of each pair of apertures 96 in each of the members 94 registers with the openings 48 in wall 50. These other of the pairs of openings are arranged in inverse relationship to said first mentioned set of openings in the member

94 whereby equalization of flow is effected regardless of the direction of flow through the oven.

In accordance with one highly desirable feature of the invention, the movement of the members 94 to shift the registry of the apertures therein with the openings 48 is effected through the reversing mechanism. As shown herein, each of the members 94 is connected to a link or rod 98 which extends through the side walls 100 of the battery. Each link 98 is connected by means of a pin and slot connection 102 to a bell crank 104 which is pivotally mounted as at 106. The other arm of the bell crank 104 is connected by means of another pin and slot arrangement 108 to a second chain 109 which preferably extends around the periphery of the battery. Chain 109 is connected to a crank 111 fixed to shaft 85 for rotation therewith to effect linear movement of chain 109 in unison with chain 82. It will be clear from this description and from Fig. 3 that when chain 109 is moved linearly by rotation of crank 111, bell cranks 104 will pivot and thereby impart linear movement to links 98 which movement is imparted to the members 94 so as to shift the registry of the apertures therein with the openings 48. It will also be obvious to those skilled in the art that by employing proper connections and linkages, the functions of the two chains 82 and 109 could be combined in one chain.

Referring now to Figs. 6 to 8, a modified form of the present invention is illustrated. In the form shown in Figs. 6 to 8, a stationary tubular member or pipe 110 is interposed between the wall 50 of the sole channels and the regenerator passages 40. Pipe 110 is provided in the bottom thereof with apertures 118 which are in registry with the passages 48 in the wall 50 and is further provided with relatively large cutouts 115 in registry with said passages 40 whereby to provide for a continuous path for the flow of combustion elements from the sole channel through the pipe 110 and into the regenerator passages 40. Rotatably mounted within pipe 110 is a second pipe or tubular member 112. Tubular member 112 is provided with cutouts 117 which are in registry with the cutouts 115 in pipe 110 and is also provided with a plurality of pairs of openings 114 and 116 each of which alternately registers with the openings 118 in the stationary pipe 110 when pipe 112 is rotated in a manner to be described hereinafter. The openings 114 and 116 are proportioned similarly to the openings 96 in the longitudinally movable members 94 hereinbefore described. With such a proportioning of the openings 114 and 116 it will be clear that uniform flow of combustion material through the regenerator passages may be effected regardless of the direction of flow.

In order to effect partial rotation of member 112 so as to shift the registry of the apertures 114 and 116 therein with the aperture 118 in stationary pipe 110, rotatable pipe 112 extends outwardly of the battery through the end wall 100. Fixed to the end 119 of pipe 112 which extends outwardly of the regenerator is a pivotally mounted bell crank 120 which is also connected to the chain 109. The connections of the bell crank to the chain and pipe are of the pin and slot type illustrated in Fig. 3. Accordingly, it will be seen that when the chains 82 and 109 are moved so as to effect reversal of the direction of flow of gaseous material through the coke oven battery, partial rotation is imparted to the rotatable pipe 112 whereby to shift registry of the apertures therein with the apertures 118 in the stationary pipe. In this manner uniformity of flow is effected regardless of the direction of flow.

Referring now to Fig. 8, means are shown therein for adjusting the size of the apertures 114 and 116 in movable tube 112 whereby to permit adjustment of the flow of gaseous fluids through the regenerator in order to obtain uniform flow therethrough. As shown in Fig. 8, the means for adjusting the size of the apertures 114 and 116 includes first pairs of plates 122 associated with apertures 114 and second pairs of plates 124 associated with the apertures 116. All of said plates 122 and 124 are of arcuate configuration whereby to permit their positioning in surface-to-surface slidable relation with the inside of tube 112. Moreover, each of said plates is provided with a slot 126 through which a stud 128 extends. Stud 128 is preferably fixed to the surface of tube 112. Threadedly engaging stud 128 and overlying a portion of the movable plates 122 and 124 are nuts 130 which may be tightened and loosened whereby to releasably hold the plates 122 and 124 in fixed relation relative to the tube 112. In order to adjust the openings 114 and 116, the nuts 130 may be loosened thereby to permit movement of the plates 122 and 124 as proscribed by the slots 126. When the openings 114 and 116 are properly proportioned, the nuts may be tightened and the device will operate as hereinbefore mentioned.

It will be obvious that any suitable means may be employed for releasably holding the plates 122 and 124 in fixed relation relative to the tube 112 and the invention is not limited to the arrangement shown. Moreover, it will be obvious that only one plate 122 and one plate 124 is necessary to achieve the adjustment desired rather than employing a pair of plates with each of said apertures.

It will be further understood from the above paragraph that the adjusting means illustrated in Fig. 8 may also be employed in connection with the members 94 illustrated in Figs. 3 to 5, said adjusting means preferably overlying the upper surface of the movable members 94 whereby to adjust the openings in said members in a manner substantially identical to the manner hereinbefore described. The openings in members 94 may also be adjusted by introducing a refractory material into said openings whereby to make them smaller.

Although I have herein shown and described several forms of the present invention, it will be understood that various changes and modifications may be made herein within the scope of the appended claims without departing from the spirit and scope of this invention.

Having now described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. In a regenerator having a wall defining a pair of horizontal longitudinally extending isolated sole channels, a plurality of passages for the flow of gaseous fluid extending upwardly from said sole channels and being spaced horizontally from one another, said wall having a plurality of horizontally spaced openings providing means for communication between said sole channels and their associated passages, means for introducing gaseous fluid into one of said sole channels and for permitting the withdrawal of gaseous fluid through the other of said sole channels whereby said one channel is an entrance channel and the other channel is an exit channel and gaseous fluid flows upwardly through the passages associated with said entrance channel and downwardly through said passages associated with said exit channel, means for introducing gaseous fluid into the other of said channels and for permitting the withdrawal of gaseous fluid through said one channel whereby said other channel is the entrance channel and said one channel is the exit channel, and reversing means for alternately actuating said last two mentioned means for reversing the flow of gaseous fluid through said regenerator; means for rendering substantially uniform the flow through said passages regardless of the direction of flow therethrough, comprising a movable member overlying said openings in said wall of said sole channels and having a pair of apertures for each of said wall openings, one of each of said pairs of apertures being in registry with its associated wall opening when said member is in one position and the other of each of said pairs of apertures being in registry with its associated opening when said member is in another position, and means operatively connecting said member to said flow reversing means for moving said member to and from its two positions when said reversing means is operated to reverse the direction of flow of said gas in said passages, said apertures being proportioned

so that regardless of which set is in registry with said wall openings, said apertures are progressively smaller as they are disposed farther away from the area of introduction of gaseous fluid into the entrance channel and are progressively larger as they are disposed away from the area of withdrawal of gaseous fluid from said exit channel.

2. In a two divided coke oven having a regenerator provided with a wall defining two isolated longitudinally extending horizontal sole channels disposed end-to-end, a plurality of passages for the flow of gaseous fluid extending upwardly from said sole channels and being spaced horizontally from one another, said wall having a plurality of horizontally spaced openings providing means for communication between said sole channels and their associated passages, means for introducing gaseous fluid into one of said sole channels and for permitting the withdrawal of gaseous fluid through the other of said sole channels whereby said one channel is an entrance channel and the other channel is an exit channel and gaseous fluid flows upwardly through the passages associated with said entrance channel and downwardly through said passages associated with said exit channel, means for introducing gaseous fluid into the other of said channels and for permitting the withdrawal of gaseous fluid through said one channel whereby said other channel is the entrance channel and said one channel is the exit channel, and reversing means for alternately actuating said last two mentioned means for reverisng the flow of gaseous fluid through said regenerator; means for rendering substantially uniform the flow through said passages regardless of the direction of flow therethrough, comprising a movable member overlying said openings in said wall of said sole channels and having a pair of apertures for each of said wall openings, one of each of said pairs of apertures being in registry with its associated wall opening when said member is in one position and the other of each of said pairs of apertures being in registry with its associated opening when said member is in another position, and means operatively connecting said member to said flow reversing means for moving said member to and from its two positions when said reversing means is operated to reverse the direction of flow of said gas in said passages, said apertures being proportioned so that regardless of which set is in registry with said wall openings, said apertures are progressively smaller as they are disposed farther away from the area of introduction of gaseous fluid into the entrance channel and are progressively larger as they are disposed away from the area of withdrawal of gaseous fluid from said exit channel.

3. In a regenerator having a wall defining a pair of horizontal longitudinally extending isolated sole channels, a plurality of passages for the flow of gaseous fluid extending upwardly from said sole channels and being spaced horizontally from one another, said wall having a plurality of horizontally spaced openings providing means for communication between said sole channels and their associated passages, means for introducing gaseous fluid into one of said sole channels and for permitting the withdrawal of gaseous fluid through the other of said sole channels whereby said one channel is an entrance channel and the other channel is an exit channel and gaseous fluid flows upwardly through the passages associated with said entrance channel and downwardly through said passages associated with said exit channel, means for introducing gaseous fluid into the other of said channels and for permitting the withdrawal of gaseous fluid through said one channel whereby said other channel is the entrance channel and said one channel is the exit channel, and reversing means for alternately actuating said last two mentioned means for reversing the flow of gaseous fluid through said regenerator; means for rendering substantially uniform the flow through said passages regardless of the direction of flow therethrough, comprising a longitudinally movable member overlying said openings in said wall of said sole channels and having a pair of apertures for each of said wall openings, one of each of said pairs of apertures being in registry with its associated wall opening when said member is in one position and the other of each of said pairs of apertures being in registry with its associated opening when said member is in another position, and means operatively connecting said member to said flow reversing means for longitudinally moving said member to and from its two positions when said reversing means is operated to reverse the direction of flow of said gas in said passages, said apertures being proportioned so that regardless of which set is in registry with said wall openings, said apertures are progressively smaller as they are disposed farther away from the area of introduction of gaseous liquid into the entrance channel and are progressively larger as they are disposed away from the area of withdrawal of gaseous fluid from said exit channel.

4. In a regenerator having a wall defining a pair of horizontal longitudinally extending isolated sole channels, a plurality of passages for the flow of gaseous fluid extending upwardly from said sole channels and being spaced horizontally from one another, said wall having a plurality of horizontally spaced openings providing means for communication between said sole channels and their associated passages, means for introducing gaseous fluid into one of said sole channels and for permitting the withdrawal of gaseous fluid through the other of said sole channels whereby said one channel is an entrance channel and the other channel is an exit channel and gaseous fluid flows upwardly through the passages associated with said entrance channel and downwardly through said passages associated with said exit channel, means for introducing gaseous fluid into the other of said channels and for permitting the withdrawal of gaseous fluid through said one channel whereby said one channel is the exit channel, and reversing means for alternately actuating said last two mentioned means for reversing the flow of gaseous fluid through said regenerator; means for rendering substantially uniform the flow through said passages regardless of the direction of flow therethrough, comprising a rotatably movable member overlying said openings in said wall and said sole channels and having a pair of apertures for each of said wall openings, one of each of said pairs of apertures being in registry with its associated wall opening when said member is in one position and the other of each of said pairs of apertures being in registry with its associated opening when said member is in another position, and means operatively connecting said member to said flow reversing means for rotatably moving said member to and from its two positions when said reversing means is operated to reverse the direction of flow of said gas in said passages, said apertures being proportioned so that regardless of which set is in registry with said wall openings, said apertures are progressively smaller as they are disposed farther away from the area of introduction of gaseous fluid into the entrance channel and are progressively larger as they are disposed away from the area of withdrawal of gaseous fluid from said exit channel.

5. In a device provided with a longitudinally extending channel having a closed and open end and a plurality of isolated passages in communication with said channel, means for periodically introducing gaseous fluid into said channel to flow therethrough and through said passages, means alternately operable with said last mentioned means for withdrawing gaseous fluid from said channel whereby to cause a reversing flow thereof through said passages and channel, and means for selectively actuating said last two mentioned means; means for controlling the flow of said gaseous fluid through said passages comprising a movable member having a plurality of pairs of apertures, one pair of each passage, one aperture of each of said pairs of apertures being in registry with their associated

passages when said member is in one position and the other aperture of each pair of apertures being in registry with said passages when said member is in another position, the apertures in registry with said passages being progressively smaller from said open end to said closed end when gaseous fluid is introduced into said open end of said channel, the apertures in registry with said passages being progressively larger from said open end to said closed end when gaseous fluid is being withdrawn from said channel, whereby flow of gaseous fluid through said passages is relatively uniform regardless of the direction of flow therethrough, and means operatively connecting said member to said actuating means for movement thereby to and from said two positions.

6. In a regenerator having a wall defining a pair of horizontal longitudinally extending isolated sole channels, a plurality of passages for the flow of gaseous fluid extending upwardly from said sole channels and being spaced horizontally from one another, said wall having a plurality of horizontally spaced openings providing means for communication between said sole channels and their associated passages, means for introducing gaseous fluid into one of said sole channels and for permitting the withdrawal of gaseous fluid through the other of said sole channels whereby said one channel is an entrance channel and the other channel is an exit channels and gaseous fluid flows upwardly through the passages associated with said entrance channel and downwardly through said passages associated with said exit channel, means for introducing gaseous fluid into the other of said channels and for permitting the withdrawal of gaseous fluid through said one channel whereby said one channel is the exit channel, and reversing means for alternately actuating said last two mentioned means for reversing the flow of gaseous fluid through said regenerator; means for rendering substantially uniform the flow through said passages regardless of the direction of flow therethrough,



comprising a rotatably movable member overlying said openings in said wall and said sole channels and having a pair of apertures for each of said wall openings, one of each of said pairs of apertures being in registry with its associated wall opening when said member is in one position and the other of each of said pairs of apertures being in registry with its associated opening when said member is in another position, and means operatively connecting said member to said flow reversing means for rotatably moving said member to and from its two positions when said reversing means is operated to reverse the direction of flow of said gas in said passages, said apertures being proportioned so that regardless of which set is in registry with said wall openings, said apertures are progressively smaller as they are disposed farther away from the area of introduction of gaseous fluid into the entrance channel and are progressively larger as they are disposed away from the area of withdrawal of gaseous fluid from said exit channel, and means for adjusting the size of each of said apertures in said rotatable member.

7. In a regenerator as defined in claim 1, said regenerator further comprising means for adjusting the size of said apertures in said movable member.

**References Cited** in the file of this patent

UNITED STATES PATENTS

| | | |
|---|---|---|
| 147,022 | Rawson | Feb. 3, 1874 |
| 150,401 | Creigh | May 5, 1874 |
| 1,041,761 | Evans | Oct. 22, 1912 |
| 1,246,114 | Koppers | Nov. 13, 1917 |
| 1,986,675 | Hobson | Jan. 1, 1935 |

FOREIGN PATENTS

| | | |
|---|---|---|
| 1,070,831 | France | Aug. 17, 1954 |
| 856,798 | France | Aug. 7, 1940 |
| 236,664 | Great Britain | July 13, 1925 |