May 9, 1933.

J. VAN ACKEREN

1,908,464

COKING RETORT OVEN

Filed April 26, 1930

4 Sheets-Sheet 1

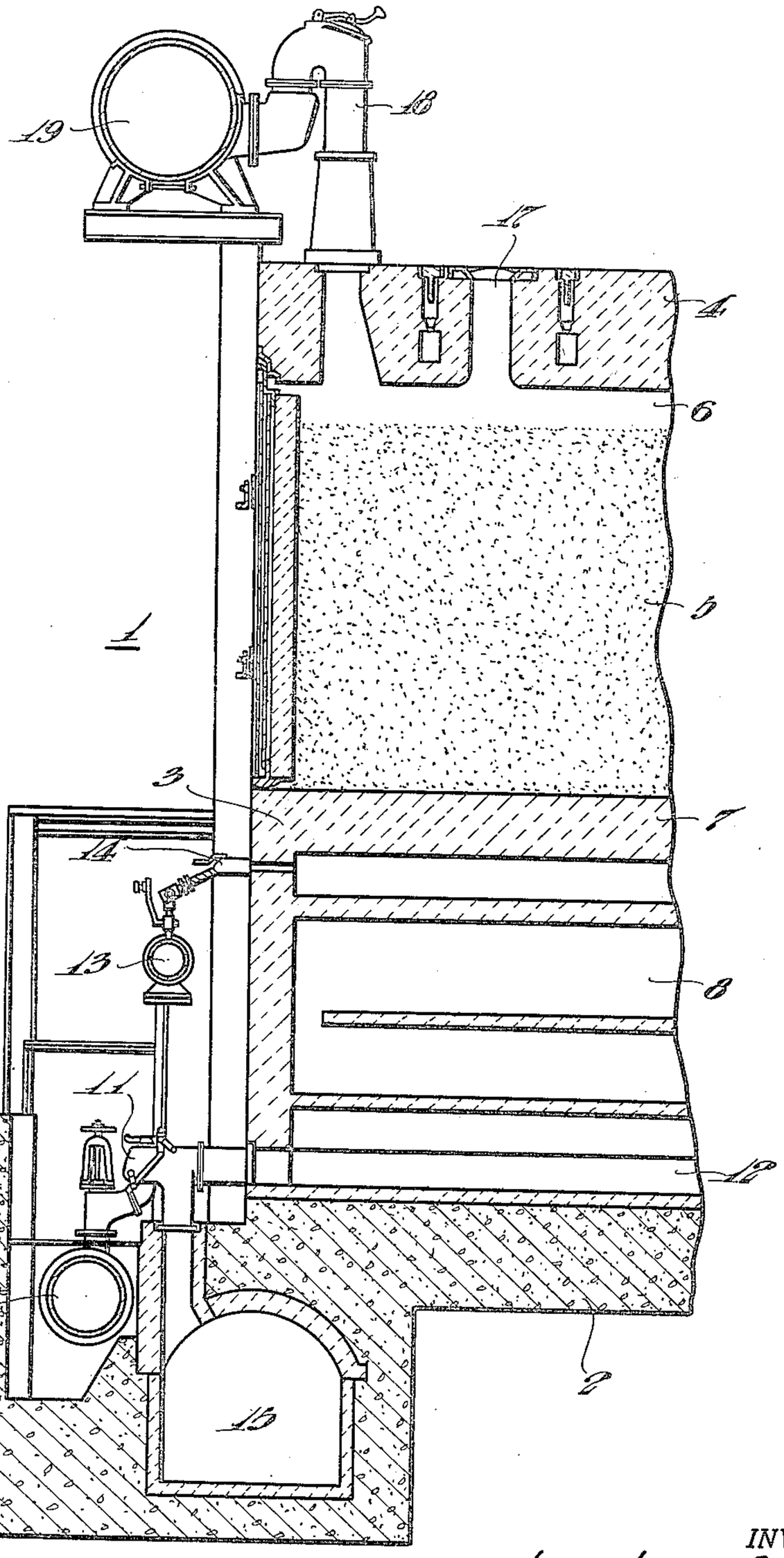

Fig. 1

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COKING RETORT OVEN

Filed April 23, 1930 4 Sheets-Sheet 2

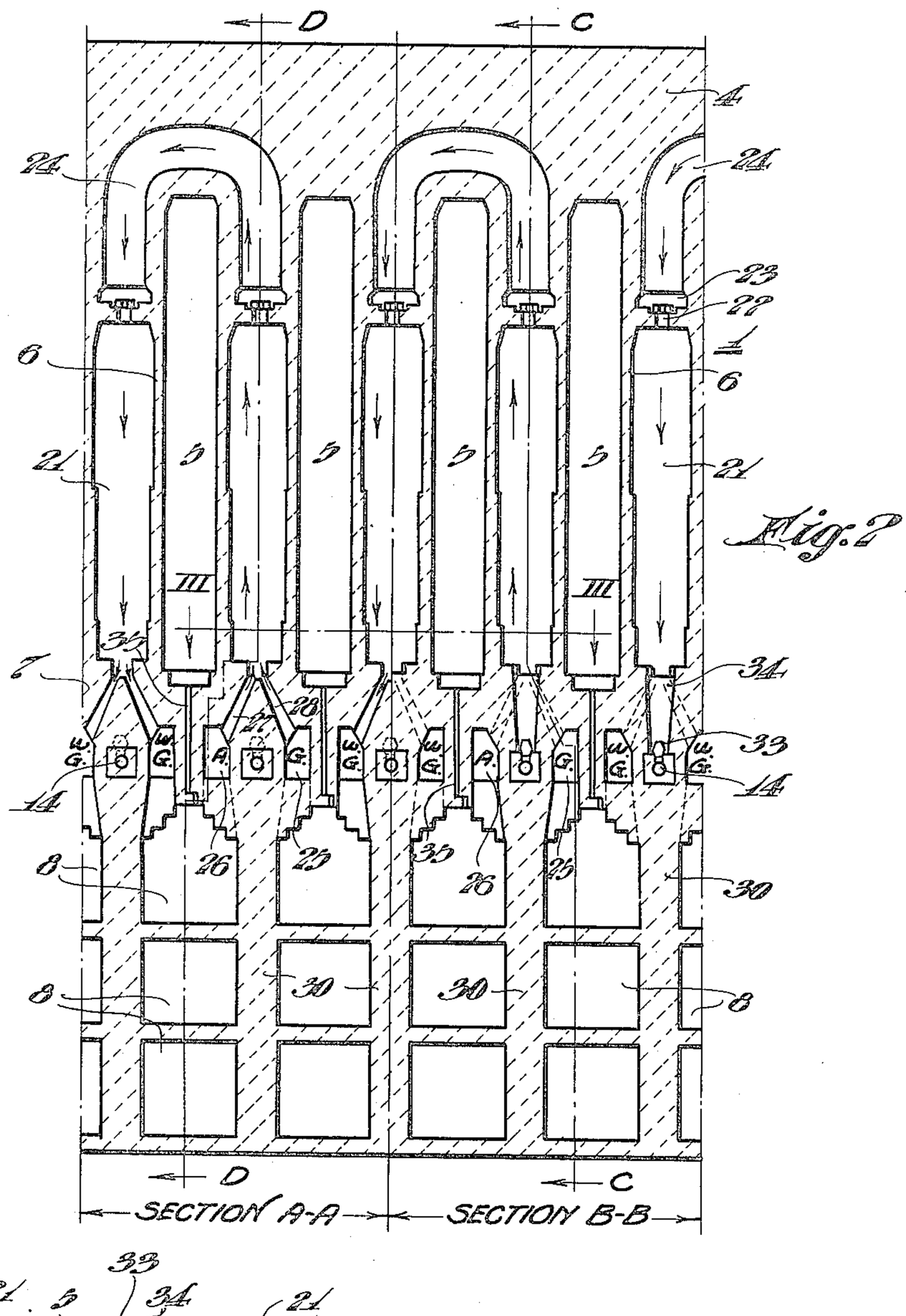

Fig. 2

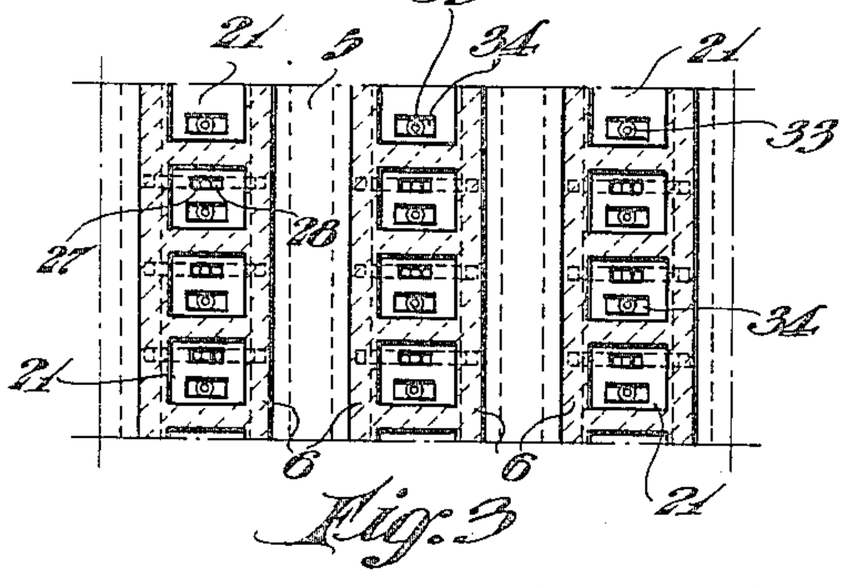

Fig. 3

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Filed April 26, 1930 4 Sheets-Sheet 3

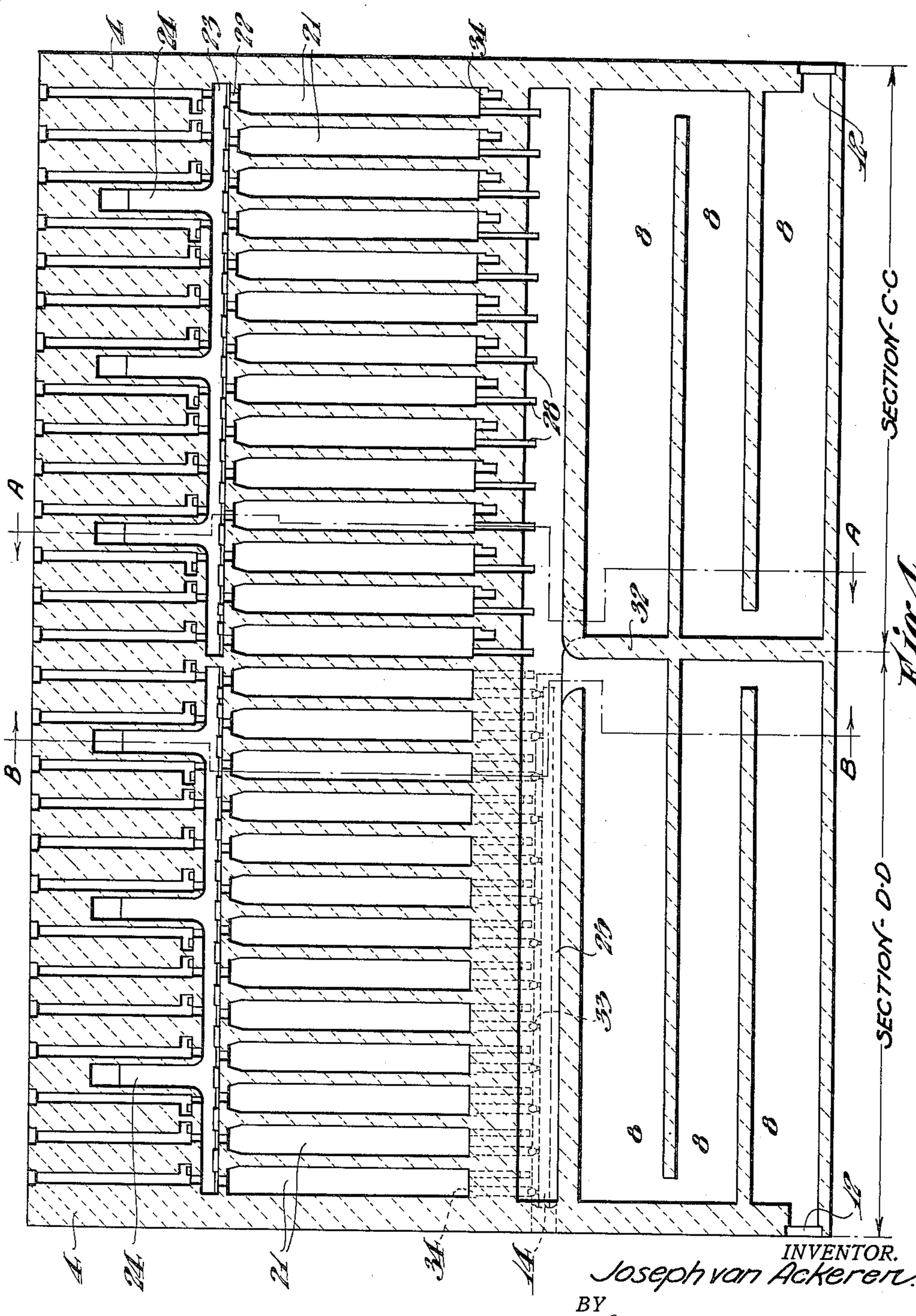

Fig: 4

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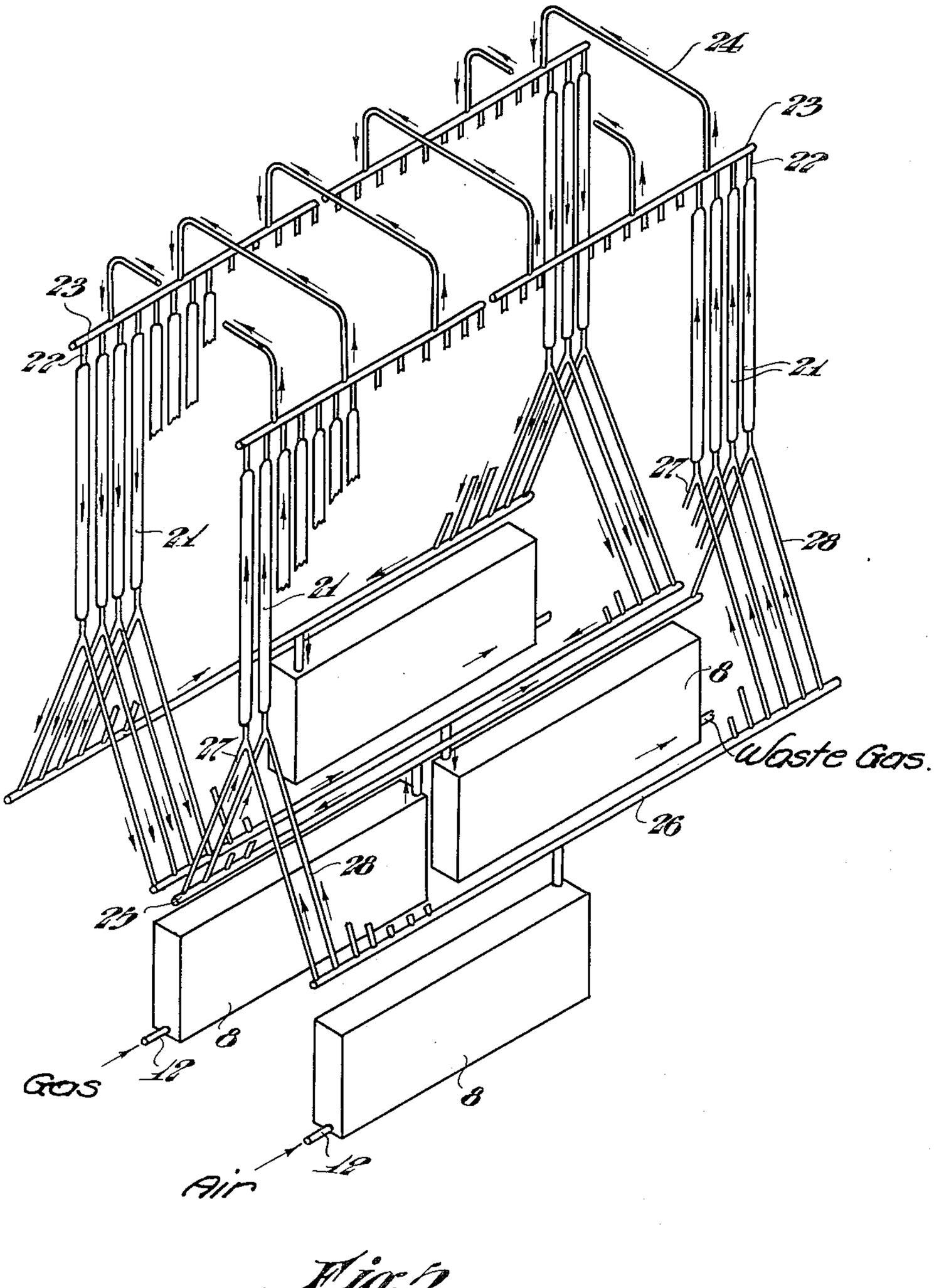

Fig. 5

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UNITED STATES PATENT OFFICE

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COKING RETORT OVEN

Application filed April 26, 1930. Serial No. 447,501.

My invention relates to coking retort ovens and particularly to horizontal ovens of the cross-regenerative type.

An object of my invention is to provide improved and simplified coking retort ovens of the type wherein an oven chamber and the heating walls therefor may be supported by a single wall beneath each of the heating walls.

A further object of my invention is to provide a system of regenerators wherein one series may be arranged for inflow while the other series is arranged for outflow without producing counterflow between fuel gas and air or between waste gas and coke-oven gas in adjacent flues or ducts.

A still further object of my invention is to provide an arrangement of the character referred to above in which horizontal flues that communicate with the flame flues of adjacent heating walls may be separated by substantially gas-tight expansion joints.

Previous coke-oven constructions of the same general character as that of my invention have had the defects that there has been counterflow between gas and air in adjacent flues or ducts. Leakage has resulted and the burning gases have damaged the brickwork and have caused the latter to fall.

There has also been counterflow between the gas guns for conveying coke-oven gas and adjacent ducts for conveying waste gases. The resultant combustion or waste of fuel gas by reason of leakages has been even more pronounced than in the case of producer gas and air.

In accordance with the present invention, I provide a single supporting wall beneath each heating wall of a horizontal coke-oven battery. The usual intermediate supporting wall beneath the oven chamber is eliminated. The space beneath adjacent pairs of supporting walls is occupied by two cross-regenerators, each of which extends substantially half the width of the battery—that is, substantially half the length of the adjacent oven chamber.

The regenerators are arranged in two series, each extending throughout half of the width of the battery. The regenerators are so connected that one series operates as inflow regenerators while the other series operates as outflow regenerators. Each regenerator communicates with all of the flame flues of one heating wall by means of a horizontal flue.

The flame flues of pairs of adjacent heating walls are connected in series. The horizontal flues for each heating wall are separated from the horizontal flues for each adjacent heating wall by means of a vertically-extending expansion joint that extends from the floor of the oven chamber into the tops of the regenerators beneath the oven chamber.

The connections of the several horizontal flues or ducts are so arranged that the pair of flues for one heating wall always carries air or air and producer gas, while the pairs of flues for the adjacent heating walls always carry waste gas. A waste-gas flue is always adjacent an air flue and, also, a waste-gas flue is always adjacent a producer gas flue, but in each case a substantially gas-tight expansion joint separates the waste-gas flue from the adjacent flue.

Furthermore, by means of my arrangement, no counterflow can occur between the gas guns for coke-oven gas and adjacent waste-gas flues because when the horizontal flues adjacent to the gas guns carry waste gases, gas is cut off from these gas guns since waste gases are flowing out through the flame flues of the corresponding heating wall.

The details of my invention will be described in connection with the accompanying drawings, in which

Figure 1 is a view in transverse vertical section of a portion of the coke oven constructed in accordance with my invention;

Fig. 2 is a composite view in longitudinal vertical section, taken on lines A—A and B—B of Fig. 4;

Fig. 3 is a horizontal sectional view, taken on line III—III of Fig. 2;

Fig. 4 is a composite view in transverse vertical section, taken on lines C—C and D—D of Fig. 2; and

Fig. 5 is a diagrammatic view in perspec-

tive illustrating the heating system of one pair of connected heating walls.

Referring particularly to Fig. 1, a coke-oven battery 1 comprises a foundation 2, a side wall 3 and a roof or top 4. A series of oven chambers 5 and heating walls 6 extend between the top 4 and horizontal brickwork 7. Regenerators 8 are located beneath the horizontal brickwork 7.

Fuel gas, such as producer gas, is supplied to the battery through a main 10 and boxes 11 connected to the sole flues 12 of the regenerators. When rich gas, such as coke-oven gas, is used as a fuel, it is supplied through a main 13 and gas guns 14. It will be understood that this structure is duplicated for the other side of the battery, which does not appear in Fig. 1.

Waste gases are withdrawn through the waste-gas main 15. Coal is supplied to the oven chambers 5 through charging openings 17 and gases of distillation are collected through ascension pipes 18 and collecting main 19.

Each of the heating walls 6 is provided with a series of vertical flame flues 21 that are connected at their top portions by means of ducts 22 to a horizontal flue 23. The horizontal flues 23 of adjacent heating walls are connected in pairs by means of crossover flues 24, whereby the flame flues of adjacent walls operate in series.

The flame flues of each heating wall are supplied with producer gas and air by means of two horizontal flues 25 and 26 that are respectively connected to each of the flame flues by inclined ducts 27 and 28. It will be readily understood that the ducts 27 and 28 and horizontal flues 25 and 26 carry waste gases when the direction of flow is reversed.

The oven chambers 5 and the heating walls 6 are supported by pillar walls 30 that are located directly beneath each of the heating walls, the usual intermediate wall beneath the oven chamber being omitted. The pillar walls 30 extend transversely of the battery throughout the length of the heating walls.

The spaces between adjacent pillar walls 30 are occupied by two series of regenerators, each series extending throughout the length of the battery and substantially half its width. The regenerators that are in endwise alinement are separated by a partition wall 32, as best shown in Fig. 4. The regenerators 8 of the form illustrated herein are shown by way of example, inasmuch as any suitable type of regenerator may be employed.

As best shown in Fig. 2, each of the gas guns 14 is connected to each of the flame flues 21 through a nozzle 33 and a vertical duct 34. The horizontal flues 25 and 26 for each heating wall extend through the horizontal brickwork 7 on each side of the gas guns 14 for the corresponding heating wall.

Expansion joints 35 extend vertically downward from adjacent the floors of the several oven chambers 5 into the tops of the regenerators 8 therebeneath. These expansion joints are filled with a suitable material, such, for example, as rock wool for rendering the expansion joints substantially gas-tight. The expansion joints 35 extend throughout the length of the oven chambers.

It may be assumed that the battery is in operation and that one heating wall of each pair connected in series is being supplied with gas and air through the regenerators 8, horizontal flues 25 and 26 and inclined ducts 27 and 28. The gaseous media thus supplied burns upwardly in alternate flame flues and the gases of combustion pass through the ducts 22, horizontal flues 23 and crossover flues 24 into the heating system of the adjacent wall and they flow outwardly through similar structure to the waste-gas main 15.

A heating system of one pair of heating walls is illustrated in Fig. 5. A portion of such system for certain heating walls is also shown in Fig. 2. It will be noted that gas and air are admitted to two regenerators 8 and are conducted through the structure previously described for distribution to the several flame flues for combustion therein. The waste gases flow out through the heating system of the adjacent wall, the outflow regenerators being offset with respect to the inflow regenerators that are connected to the same system.

When the gases are traversing the several heating walls illustrated in Fig. 2 in the direction of the arrows, the horizontal flues 25 and 26 are conveying gaseous media, as indicated by the legends A, G and WG, indicating, respectively, air, gas and waste gas.

It will be noted that one horizontal flue of each pair carrying waste gases is adjacent to a flue carrying air, but this arrangement does not cause any difficulty. The other waste-gas flue is adjacent to a flue carrying fuel gas, but these adjacent horizontal flues are separated by means of a substantially gas-tight expansion joint 35, which effectually prevents any leakage therebetween. The first-mentioned waste-gas flue is also separated from the adjacent air flue by a similar expansion joint.

When coke-oven gas is used as a fuel, no counterflow can occur between the gas guns and waste-gas flues because no coke-oven gas is supplied to a heating wall conveying waste gases to the corresponding horizontal flues.

When the flow of gases through the battery is reversed, as occurs periodically in accordance with established practice, the horizontal flues previously carrying waste gas now respectively carry air and fuel gas, while the flues marked A and G now carry waste gases. As in the case of operation in the previous direction, the expansion joints sep-

arate the horizontal flues carrying combustible media from those carrying waste gases.

The advantages of the construction of my invention are that the arrangement beneath the oven chambers and heating walls is materially simplified by the elimination of the intermediate wall. The horizontal flue system for each heating wall is segregated by means of the expansion joints which extend from the oven chambers to the regenerators therebeneath.

By means of the arrangement of the regenerators and the horizontal flues connected thereto, I have eliminated any counterflow between gas and air that are carried in adjacent flues or ducts. Also, all counterflow between gas guns and adjacent waste-gas flues has been eliminated. The elimination of the counterflow removes the possibility of combustion of gases at points other than the flame flues and the failure of the brickwork incident to such combustion has been avoided.

The foregoing and other advantages will be apparent to those skilled in the art relating to the construction and operation of coking retort ovens.

I claim as my invention:

1. Coke-oven structure comprising a series of alternate coking chambers and heating walls therefor arranged side-by-side in a row, each of said heating walls having a plurality of flame flues therein and the flame flues of adjacent walls being connected in pairs for operation in series, means for supporting said oven chambers comprising a single supporting wall beneath each of said heating walls and parallel therewith, two regenerators in endwise alinement between each pair of the adjacent supporting walls, and parallel horizontal flues communicating with said flame flues and with said regenerators for supplying air and fuel gas thereto and for withdrawing waste gases therefrom, the connections of said horizontal flues being so arranged as to prevent counterflow between fuel gas and air in adjacent portions of horizontal flues.

2. Coke-oven structure comprising a series of alternate coking chambers and heating walls therefor arranged side-by-side in a row, each of said heating walls having a plurality of flame flues therein and the flame flues of adjacent walls being connected in pairs for operation in series, means for supporting said oven chambers comprising a single supporting wall beneath each of said heating walls and parallel therewith, two regenerators in endwise alinement between each pair of the adjacent supporting walls, parallel horizontal flues communicating with said flame flues and with said regenerators for supplying air thereto and for withdrawing waste gases therefrom, and gas guns for supplying coke-oven gas to said flame flues, the connections between said horizontal flues, flame flues and regenerators being so arranged as to prevent counterflow between gases in the gas guns and gases in the adjacent horizontal flues carrying waste gases.

3. Coke-oven structure comprising a series of alternate coking chambers and heating walls therefor arranged side-by-side in a row, each of said heating walls having a plurality of flame flues therein and the flame flues of adjacent walls being connected in pairs for operation in series, means for supporting said oven chambers comprising a single supporting wall beneath each of said heating walls and parallel therewith, two regenerators in endwise alinement between each pair of the adjacent supporting walls, parallel horizontal flues communicating with said flame flues and with said regenerators for supplying air and fuel gas thereto and for withdrawing waste gases therefrom, and gas guns for supplying coke-oven gas to said flame flues, the connections between said regenerators, horizontal flues and flame flues being so arranged as to prevent, when producer gas is used as fuel, counterflow between producer gas and air in adjacent portions of horizontal flues, and when coke-oven gas is used as fuel, counterflow between gases in the gas guns and gases in the adjacent horizontal flues carrying waste gases.

4. Coke-oven structure comprising an oven chamber having a bottom wall, a heating wall on each of two opposite sides of said oven chamber, combustion means for the heating walls, means for supporting said oven chamber and said heating walls consisting of a single supporting wall beneath each of said heating walls and parallel therewith, two horizontal regenerators extending in endwise alinement between said supporting walls and an expansion joint extending from the bottom of said oven chamber and throughout its length to the tops of said regenerators.

5. Coke-oven structure comprising an oven chamber, a heating wall on each of two opposite sides thereof, combustion means for the heating walls, a supporting wall beneath each heating wall and parallel therewith, regenerator structure between said supporting walls, parallel horizontal flues for said heating walls and adjacent said supporting walls for respectively carrying gaseous media in opposite directions and an expansion joint extending from said oven chamber to said regenerator structure and between said horizontal flues.

6. Coke-oven structure comprising a series of alternate horizontal coking chambers and heating walls therefor arranged side-by-side in a row, combustion means for said heating walls, two parallel horizontal series of regenerators beneath said oven chambers, each of said regenerators extending approximately half the length of said oven chambers, means for connecting said regenerators

for operation of one series for inflow while the other series operates for outflow of gases, said connecting means comprising a horizontal flue communicating with each of said regenerators, and an expansion joint between the adjacent horizontal flues that are respectively connected to inflow and outflow regenerators.

7. Coke-oven structure comprising a series of alternate horizontal coking chambers and heating walls therefor arranged side-by-side in a row, two parallel horizontal series of regenerators extending beneath said oven chambers and each of said regenerators being approximately half the length of said oven chambers, each of said heating walls having flame flues therein, two parallel horizontal flues that communicate with the flame flues of each of said heating walls, two regenerators in the same series communicating with said horizontal flues respectively, and an expansion joint extending between the horizontal flues that communicate with the flame flues of adjacent heating walls.

8. Coke-oven structure comprising a series of alternate horizontal coking chambers and heating walls therefor arranged side-by-side in a row, two parallel horizontal series of regenerators extending beneath said oven chambers and each of said regenerators being approximately half the length of said oven chambers, each of said heating walls having flame flues therein, two parallel horizontal flues that communicate with the flame flues of each of said heating walls, two regenerators in the same series communicating respectively with said horizontal flues, and an expansion joint extending from the bottom of each oven chamber to regenerators therebeneath to separate the horizontal flues that communicate with the flame flues of adjacent heating walls.

9. Coke-oven structure comprising an oven chamber, regenerator structure beneath said chamber, a heating wall on each of two opposite sides of said chamber and having flame flues therein, horizontal flues communicating with the flame flues of each of said heating walls, and an expansion joint extending from the bottom of said oven chamber to said regenerator structure and between the horizontal flues communicating with flame flues of the respective heating walls.

10. Coke-oven structure comprising an oven chamber, regenerator structure beneath said chamber, a heating wall on each of two opposite sides of said oven chamber and having vertical flame flues therein, the flame flues of one heating wall being connected at their top portions in series with the flame flues of the other heating wall, parallel horizontal flues connected to the bottom portions of the flame flues of each of said heating walls for concurrently supplying combustible media through part of said horizontal flues and conveying waste gases in another part of said horizontal flues, and an expansion joint extending from said oven chamber to said regenerator structure and between two horizontal flues which are adapted for concurrently and separately carrying combustible media and waste gases, respectively.

11. A coke-oven battery comprising a series of alternate coking chambers and heating walls therefor arranged side-by-side in a row, means for supporting said oven chambers and said heating walls consisting of a single supporting wall beneath each of said heating walls and parallel therewith, a horizontal series of regenerators arranged side-by-side and each occupying substantially half of the space between adjacent supporting walls, a second series of regenerators parallel to the first series occupying substantially the remaining halves of the spaces between said supporting walls, each of said heating walls having vertical flame flues and the flame flues of pairs of adjacent heating walls being connected in series, parallel horizontal flues communicating with the flame flues of said heating walls and with said regenerators to operate one series of regenerators for inflow and the other series for outflow of gases, and a substantially gas-tight expansion joint extending from each oven chamber into the regenerators therebeneath and between horizontal flues that are respectively connected to inflow and outflow regenerators.

12. Coke-oven structure comprising a series of alternate coking chambers and heating walls therefor and arranged side-by-side in a row, each of said heating walls having a plurality of flame flues therein and the flame flues of each of said walls being communicably connected for gas flow in series with flame flues in another of said walls, means for supporting said oven chambers comprising a single supporting wall beneath each of said heating walls and parallel therewith, two horizontal regenerators in endwise alinement between each pair of adjacent supporting walls, parallel horizontal flues communicating with said flame flues and with said regenerators for supplying air and fuel gas thereto and for withdrawing waste gases therefrom, and means for regulating the flow of gases in said structure to operate alternate heating walls for combustion therein and the other heating walls for the outflow of waste gases.

13. Coke-oven structure comprising a series of alternate coking chambers and heating walls therefor arranged side-by-side in a row, each of said heating walls having a plurality of flame flues therein and the flame flues of each of said walls being communicably connected for gas flow in series with flame flues in another of said walls, means for supporting said oven chambers comprising a single supporting wall beneath each of said

heating walls and parallel therewith, two horizontal regenerators in endwise alinement between each pair of the adjacent supporting walls, two parallel horizontal flues communicating with the flame flues of each heating wall and each of said horizontal flues communicating with one regenerator, said regenerators being arranged in side-by-side alinement in two rows, one of said rows adapted to operate as inflow regenerators while the other row operates as outflow regenerators.

In testimony whereof, I have hereunto subscribed my name this 23rd day of April, 1930.

JOSEPH VAN ACKEREN.