July 8, 1930. C. OTTO 1,770,285

GAS PRODUCING OVEN

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Fig. 1.

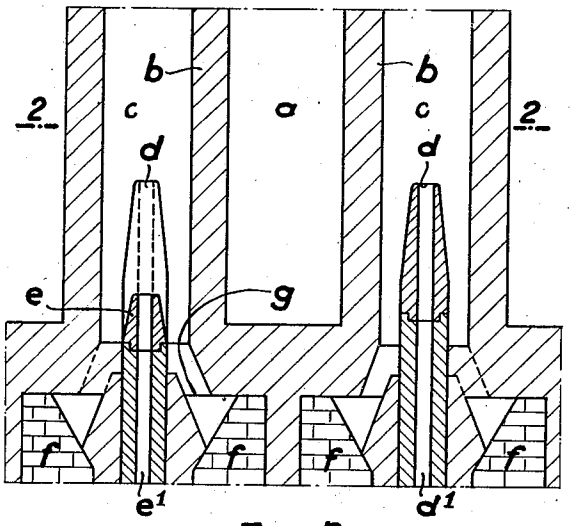
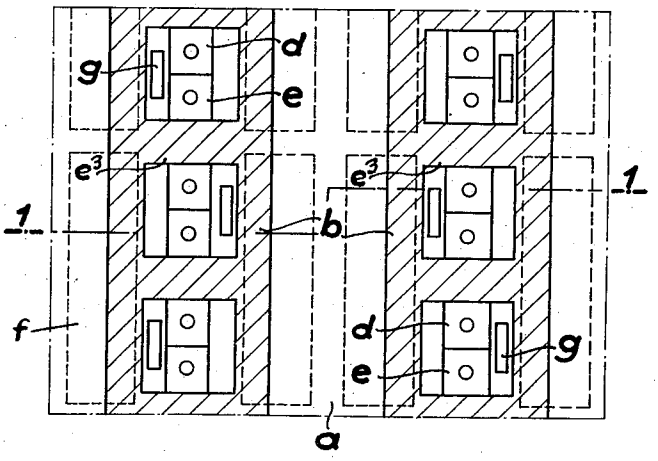


Fig. 2.



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Fig. 3.

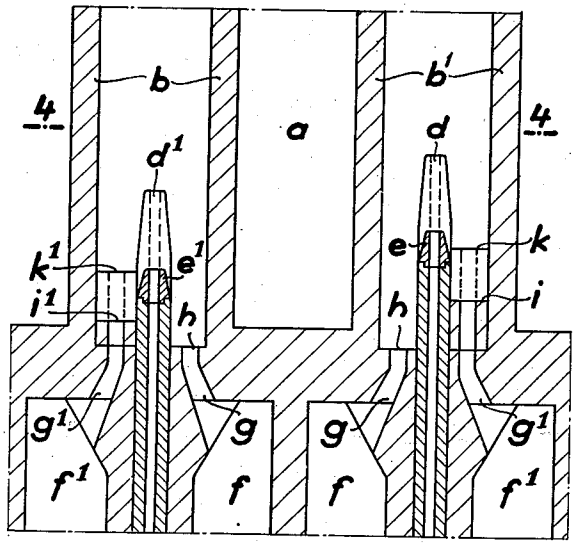
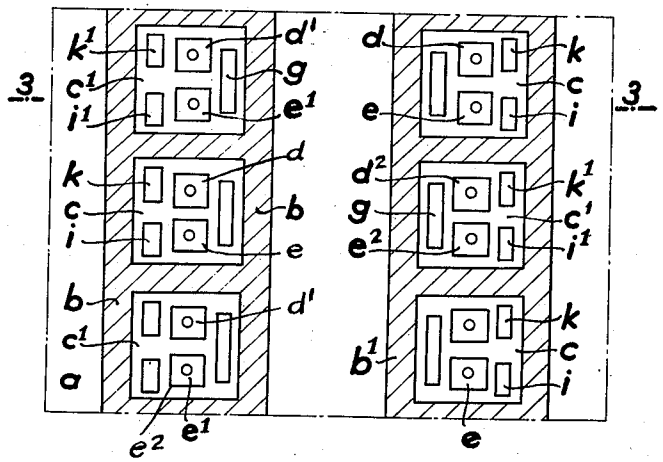


Fig. 4.



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Fig. 5.

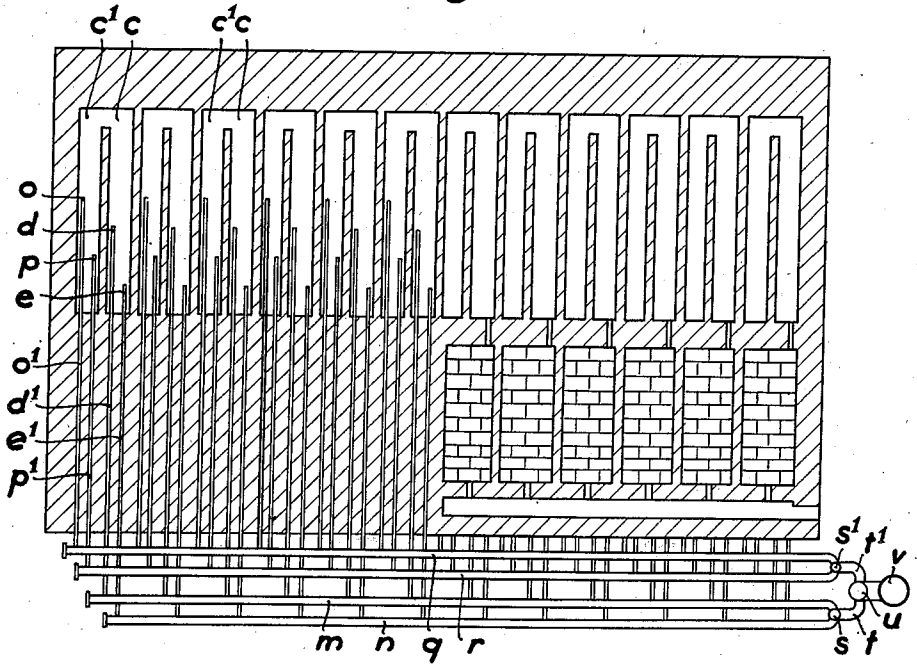
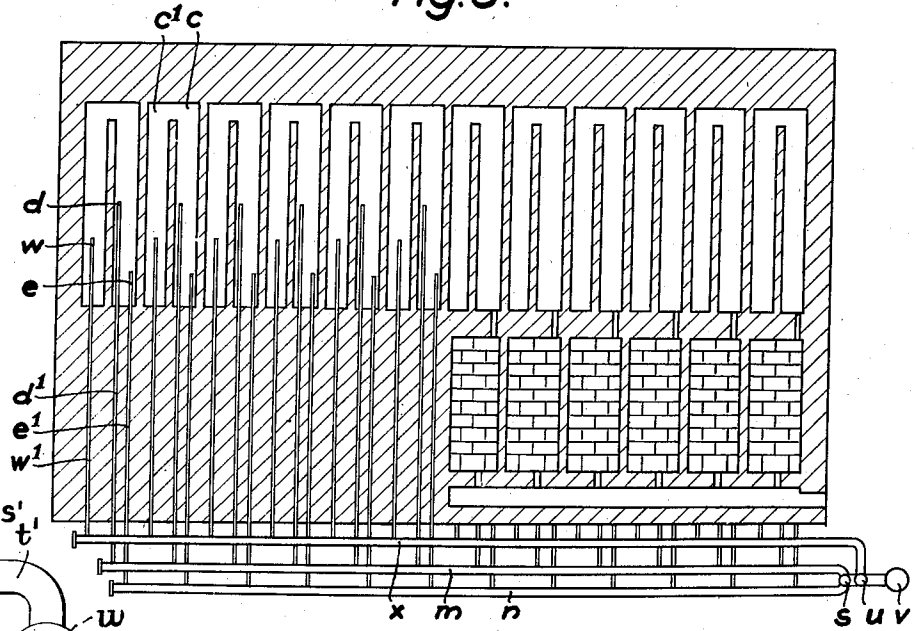


Fig. 6.



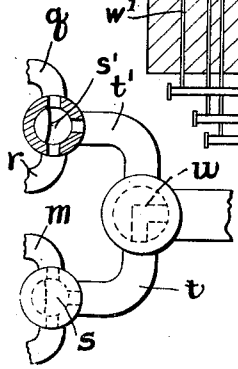


Fig. 7.

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UNITED STATES PATENT OFFICE

CARL OTTO, OF ESSEN-RUHR, GERMANY

GAS-PRODUCING OVEN

Application filed March 5, 1929, Serial No. 344,412, and in Germany November 25, 1925.

It has already been proposed, for the purpose of regulating the level of the points of union of gas and air in the heating flues of coke ovens, to adjustably arrange the individual inlets to the flues of the strong gas of each heating wall as to their vertical distances from the inlets, of the air or the air-weak gas mixture located at the bottom of the heating flue. The level of the strong gas inlets is varied by putting nozzle tubes of different length on the stationary nozzle bricks of the strong gas feeding conduit.

The burner arrangement and gas supply for the heating flues of gas producing ovens forming the subject-matter of the present invention, constitutes a continuation in part of my prior application Serial No. 83,964 (Patent No. 1,748,143), and relates to a particularly suitable and advantageous further development of the heating arrangement by providing in each heating flue a plurality of strong gas (rich gas, for example coke oven gas) inlets arranged at different levels above the air inlets located at the bottom of the heating flue, which strong gas inlets can be supplied selectively with gas from their respective ascension conduits. The possibility is afforded hereby of displacing the greatest heating effect in each heating flue within the shortest time as desired either into upper or lower sections of the heating flues so that the oven can be adapted in a degree not obtained hitherto, to the different and varying requirements of heat of its indivdual portions. The calorific value of the fuel supplied to the heating wall portions located above each individual burner point between two reversals may also be varied, as by varying the composition of the gas-air mixture supplied between two reversals. It is possible, to obtain by means of this burner arrangement a multi-level heating that corresponds to the number of strong gas inlets existing in the individual heating flues. A heating of this character will be of a particular importance with the modern coke ovens having horizontal coking chambers and recently employed more and more, which chambers have a height of more than 4 meters. Every strong gas inlet of each heating flue may be set in communication with the strong gas supply pipe by a special ascension conduit that selectively may be connected thereto by a controlling valve. Furthermore, all the ascension conduits leading to the strong gas inlets of equal level of a heating wall may be connected each with a special feeding pipe adapted to be selectively connected to the gas main by means of a controlling valve.

A further improvement and refinement of the above-explained idea of the invention may consist in the strong gas inlets, provided in each heating flue, of different level above the floor of the latter having different levels also relatively to the strong gas inlets of the neighboring heating flues.

Furthermore, also the weak gas (for example, producer gas) inlets may have levels differing in the individual heating flues, a plurality of such inlets of different level being preferably provided in each heating flue. Besides, the change in feeding the individual strong gas inlets within each heating flue may be performed independently of the reversal and of the change, required therefor, in the gas supply to the heating flues themselves. This construction of the hereinbefore described gas supply is particularly well suited to be applied to twin flue ovens.

Four embodiments of the invention are illustrated by way of example in the accompanying drawings, in which Figures 1 and 2 relate to the first, Figures 3 and 4 to the second, Figure 5 to the third, and Figure 6 to the fourth embodiment. In particular

Figure 1 is a vertical longitudinal section through the oven battery on line 1—1 of Figure 2,

Figure 2 is a horizontal section on line 2—2 of Figure 1, seen from the top,

Figure 3 is a vertical longitudinal cross section through the oven batttery on line 3—3 of Figure 4,

Figure 4 is a horizontal cross section on line 4—4 of Figure 3, seen from the top,

Figure 5 is a vertical longitudinal section through a heating wall, and

Figure 6 is likewise a vertical longitudinal section through a heating wall.

Figure 7 is a detail view of the valve con-

trolling the gas supply from the main to the supply pipes and the valves controlling the supply thru the supply pipes.

Referring first to Figures 1 and 2 that show the first embodiment, b denotes the heating walls arranged in the usual manner between the horizontally elongated oven chambers a, each heating wall being subdivided so as to form a plurality of vertical heating flues c the bottoms of the flues being at the same level. Two strong gas nozzle bricks d, e form the gas inlets and are preferably arranged in each heating flue c and communicate through appurtenant ascension conduits d^1 and e^1 with a suitable strong gas feeding pipe. The combustion air is supplied to each heating flue at its bottom from the regenerators f by connecting channels g. The supply of strong gas to the higher nozzle bricks d and to the lower ones e may be made by the appurtenant ascension conduits d^1 and e^1. The ascension conduits by means of a suitable supply pipe may be connected to the strong gas main v (see Figure 5). They may be selectively connected with the strong gas supply pipe by means of a controlling valve or the like. A modification of this arrangement may consist in all nozzle bricks d with their ascension conduits d^1 on the one hand, and all bricks e with their ascension conduits e^1 on the other hand being connected each to a special supply pipe branched off from the strong gas main, which branch pipes may likewise be connected selectively to the said strong gas main by means of a controlling valve (see Figure 5). This modification affords the advantage of the gas supply being changed at once by a single motion of the valve from the higher nozzle bricks to the lower ones and vice-versa. By the first-mentioned arrangement it is possible for each heating flue to be set to the higher or lower nozzle bricks independently of the other flues.

The nozzle bricks d and e may be disposed either close to one another and in close connection to the heating flue separating walls c^3 or they may be designed as freely standing tubular burners, that open at different levels above the floor of the oven. Furthermore, the bricks d and e may be composed of a plurality of exchangeable portions.

As to be understood without any further explanation, the hereinbefore described burner arrangement can be employed also in combined ovens which are selectively or commonly heated with strong and weak gas. In this case the regenerators are subdivided in a well-known manner into weak gas regenerators and air regenerators, each heating flue being connected to a gas regenerator and an air regenerator.

The described burner arrangement can be employed as well in coke ovens with various heating gas supply, such as regenerative and recuperative ovens, as also with any kind of subdivision of the heating walls, such as into halves, groups or twin flues.

The second embodiment will now be described with reference to Figures 3 and 4, wherein parts that correspond to the first embodiment, are denoted by the same reference letters.

Two strong gas inlets d and e, d^2, e^2 located at different levels above the bottoms h of the heating flues are arranged in the flues of the heating walls b, b^1. According to the invention the inlets d and e of one heating flue c (Figure 4) are also arranged at another level above the floor h of the flue than the corresponding inlets d^2 and e^2 of the neighbouring heating flues c^1.

The same difference of the level of the strong gas inlets exists also with the corresponding heating flues of neighbouring heating walls, as particularly to be seen from Figure 3. In this manner a chess board-like distribution of the strong gas inlets of equal level above the floor is obtained throughout the entire oven plant, and it is further obtained thereby that each oven chamber gets a four-level heating, whereby even with the greatest chamber height an absolutely uniform heating of the charge in vertical direction is secured.

While with pure strong gas heating all the regenerators f serve to preheat the combustion air, which is supplied to the heating flues at their floor h by the channels g, in weak gas heating the moiety of the regenerators is set to gas in the usual manner. The regenerators serving to preheat the gas, and the channels connecting them with the heating flues are denoted by f^1 and g^1 in Figure 3. In spite of the fact, that normally in weak gas heating no multi-level heating is required due to the flame being long in itself, it will be desirable owing to the height of the oven chamber having recently been extraordinarily increased. To this end two weak gas inlets i and k may be arranged in each heating flue c, which have determined different levels above the bottom h of the flue, each inlet communicating with the respective regenerator f^1 by a channel g^1. According to the example given by the arrangement of the strong gas inlets, also the weak gas inlets i^1 and k^1 of the neighbouring heating flues c^1 differ in level above the bottom h from the corresponding inlets i and k of the flues c. As to be seen from Figure 3, in this case two inlets of different level are opposite one another in the corresponding heating flues of neighbouring heating walls b, b^1.

It is presumed in the described embodiment, that the weak gas inlets existing in each heating flue are fed with gas in common, whilst the strong gas inlets are fed with gas alternately. Of course, according to the arrangement of the regenerators an

alternate feeding of the weak gas inlets may be effected, and the strong gas inlets may also be supplied with gas in common.

The third and fourth embodiment will now be described with reference to Figures 5 and 6, parts corresponding to the first embodiment being denoted by the same reference letters.

Referring to the third embodiment, the heating flues c are designed in pairs c^1. As usual in twin flue heating, either the alternate flues c of a wall or the intermediate flues c^1 are fed with gas. Of the strong gas inlets of each flue c, the higher inlets, d, are connected through the appurtenant ascension conduits d^1 to a supply pipe m, whilst the lower inlets e through their ascension conduits e^1 are connected to a supply pipe n. In each flue c^1 is likewise provided a higher and a lower inlet o and p, respectively. All inlets o are connected through ascension conduits o^1 to a supply pipe q and all inlets p through the ascension conduits p^1 to a supply pipe r. By means of a three-way valve s and s^1, respectively, the pipes m and n on the one hand and the pipes q and r on the other hand may be fed each with gas either commonly or alternately. The bends t and t^1 leading to the valves s and s^1 may be selectively set in connection with the gas main v by means of a controlling valve u. As shown in Fig. 7, valve u is in position to allow gas to flow to bend t. Upon reversal of the oven, valve u is turned to supply gas to bend t'. Bend t' is connected to supply pipes q and r by a valve s'. The valve s', as shown, is in position to supply gas to both pipes q and r. Turning the valve 90 degrees will cut the gas supply off from one of the pipes and permit gas to flow to the other of said pipes. Bend t communicates with supply pipes m and n by means of a similar valve s.

The heating takes place in the following manner:

When the heating flues c^1 are used, the bend t^1 is fed with gas from the main v by positioning the valve u correspondingly. The strong gas flowing through the bend t^1 is distributed according to the position of the three-way valve s^1 either to the pipes q and r or only to one of these pipes, for example, the pipes q. In the former case all inlets o and p of the heating flues c^1 are fed with gas, whilst in the latter case only the higher inlets o are fed. To feed gas to the lower inlets p, only the valve s^1 is set correspondingly, without the valve u needing to be re-adjusted, while the bend t^1 is permanently fed. This change of the gas supply between the higher and lower inlets o and p, respectively, takes place advantageously in the intervals between the reversal of the controlling valves u.

After the flues c^1 have been fed during a sufficiently long time, for example, half an hour, the usual reversal takes place which, as to the gas supply is effected by reversing the valves u. Now the bends t are fed with gas and from these, by suitably positioning the valves s, the pipes m and n are supplied either in common or only one of them. As to be understood without further explanation, in this case too a reversal of the gas supply to the group m or n is made best in the intervals between the reversal of the valves u. The valves s and s^1 may be designed so as to feed gas in one end position only the pipes m or q, in the other end position only the pipes n or r, and in the intermediate position both pipes m and n or q and r. In this manner it is possible to set all valves s or s^1 at the desired position by means of one single pull member actuated from the reversing winch. As usual, also the valves u are actuated by means of one pull member from the winch.

The described gas supply affords the advantage of the change of feed of the heating flues c and c^1, obtained by the reversal of the valves u and of the air supply, being effected quite independently of the manner of heating within the individual heating flues. As already pointed out, the two gas inlets of each fed heating flue may be supplied with gas either in common or alternately. It is therefore possible to displace in the simplest manner the highest heating effect in each flue as desired either into upper or lower sections of the flue. If now, as illustrated, the inlets d and e of the flues c differ in level not only from one another, but also relatively to the corresponding inlets o and p of the flues c^1, a four-level heating is obtained and the inlets of each individual level can be fed with gas for a period of any desired duration.

The embodiment illustrated in Figure 6 substantially differs from the last-described by the fact, that the inlets o and p of the alternate heating flues and their ascension conduits o^1 and p^1 are combined so as to form each one single inlet w and conduit w^1, the supply pipes q and r consequently forming also one pipe x. In this modified gas supply a valve s may of course be dispensed with the pipe x. In spite of this notable simplification a three-level heating is still possible in this modification, if the level of the inlet w differs from that of the inlets d and e.

The above-described invention is of course not limited to the heating of twin flues, although it affords its greatest advantages even with this construction. So the invention may be employed with ovens the walls of which are heated in halves, this being performed in the simplest manner by juxtaposing on the one hand flues c and all flues c^1 on the other hand and designing the gas sup-

ply accordingly, by arranging the bends t with the valves s and the appurtenant pipes m and n on the one side of the main v and the bends t^1 with the valves s^1 and pipes q and r on the other side of main v and by now feeding with gas the right-hand or left-hand half of the heating wall by reversing the valves u. In a similar manner the invention may be employed best with ovens in all the flues of one heating wall of which the same gas direction is always prevailing, by providing in one heating wall only flues c and in the other wall only flues c^1.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare, what I claim, is:—

1. In a gas producing oven having a horizontally elongated oven chamber, heating walls therefor arranged on two opposite sides of said chamber, each of said heating walls being subdivided into vertical heating flues, the bottoms of said flues being at the same level, a plurality of strong gas inlets for each of a plurality of said flues, the inlets within each of said flues being arranged at different levels above the bottom of the flue, means for supplying strong gas jointly or independently to said inlets and means for supplying air at the bottoms of the flues.

2. In a gas producing oven having a horizontally elongated oven chamber, heating walls therefor arranged on two opposite sides of said chamber, each of said heating walls being subdivided into vertical heating flues, the bottoms of said flues being at the same level, a plurality of strong gas inlets arranged within each alternate flue of each of the heating walls, the inlets within each of said alternate flues being arranged at different levels above the bottom of the flue, means for supplying strong gas jointly or independently to said inlets and means for supplying air to said flues below said inlets.

3. In a gas producing oven having a horizontally elongated oven chamber, heating walls therefor arranged on two opposite sides of said chamber, each of said heating walls being subdivided into vertical heating flues the bottoms of said flues being at the same level, a plurality of strong gas inlets arranged within each of said flues, the inlets of each of the flues being arranged at different levels above the bottom of the flue, means for supplying strong gas jointly or independently to said inlets and means for supplying air to said flues, at the bottoms of the flues.

4. In a gas producing oven having a horizontally elongated oven chamber, heating walls therefor arranged on two opposite sides of said chamber, each of said heating walls being subdivided into vertical heating flues the bottoms of said flues being at the same level, a plurality of strong gas inlets arranged within each of said flues, the inlets of each of the flues being arranged at different levels above the bottom of the flue, the inlets of the flue being also arranged at different levels with relation to the inlets of a neighboring flue, means for supplying strong gas to said inlets and means for supplying air to said flues below the inlets.

5. In a gas producing oven having a horizontally elongated oven chamber, heating walls therefor arranged on two opposite sides of said chamber, each of said heating walls being subdivided into vertical heating flues the bottoms of said flues being at the same level, a plurality of strong gas inlets for each of said flues, the inlets of each of the flues being arranged at different levels above the bottom of the flue, the inlets of the flue being also arranged at different levels with relation to the inlets of a flue in a neighboring heating wall, means for supplying strong gas to said inlets and means for supplying air to the flues below said inlets.

6. In a gas producing oven having a horizontally elongated oven chamber, heating walls therefor arranged on two opposite sides of said chamber, each of said heating walls being subdivided into vertical heating flues the bottoms of said flues being at the same level, a plurality of strong gas inlets arranged within each of said flues, the inlets of each of the flues being arranged at different levels above the bottom of the flue, the inlets of the flue being arranged at different levels with relation to the inlets of a neighboring flue in the same wall, and being also arranged at different levels with relation to the inlets of a flue in a neighboring heating wall, means for supplying strong gas to said inlets and means for supplying air to said flues.

7. In a gas producing oven having a horizontally elongated oven chamber, and adapted to be heated selectively with strong gas or weak gas, heating walls therefor arranged on two opposite sides of said chamber, each of said heating walls being subdivided into vertical heating flues the bottoms of said flues being at the same level, a plurality of strong gas inlets arranged within each of a plurality of said flues, the inlets of each of the flues being arranged at different levels above the bottom of the flue, a plurality of weak gas inlets arranged within each of a plurality of said flues, means for supplying strong gas to said strong gas inlets, means for supplying weak gas to said weak gas inlets and means for supplying air to said flues below said inlets.

8. In a gas producing oven having a horizontally elongated oven chamber, and adapted to be heated selectively with strong gas or weak gas, heating walls therefor arranged on two opposite sides of said chamber, each of said heating walls being subdivided into vertical heating flues the bottoms of said flues being at the same level, a plurality of strong

gas inlets arranged within each of said flues, the inlets of each of the flues being arranged at different levels above the bottom of the flue, a plurality of weak gas inlets arranged within and at different levels above the bottom of each of said flues, the strong gas inlets of each of said flues being also arranged at different levels with relation to the weak gas inlets of the said flue, means for supplying strong gas to the strong gas inlets, means for supplying weak gas to the weak gas inlets, and means for supplying air to the flues below said inlets.

9. In a gas producing oven having a horizontally elongated oven chamber, heating walls therefor arranged on two opposite sides of said chamber, each of said heating walls being subdivided into vertical heating flues the bottoms of said flues being at the same level, a plurality of strong gas inlets arranged within and at different levels above the bottom of each of said flues, the inlets of alternate flues of a wall being also arranged at different levels with relation to the intermediate flues of the same heating wall, an ascension conduit communicably connected to each of the inlets of the flues, gas supply pipes, the conduits for the inlets of equal level in one of said walls being communicably connected to an individual supply pipe, a strong gas main, communicating connections between the strong gas main and the gas supply pipes, valve means for controlling the supply of gas to the strong gas inlets and means for supplying air to the flues, below said inlets.

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

CARL OTTO.