

No. 763,533.

PATENTED JUNE 28, 1904.

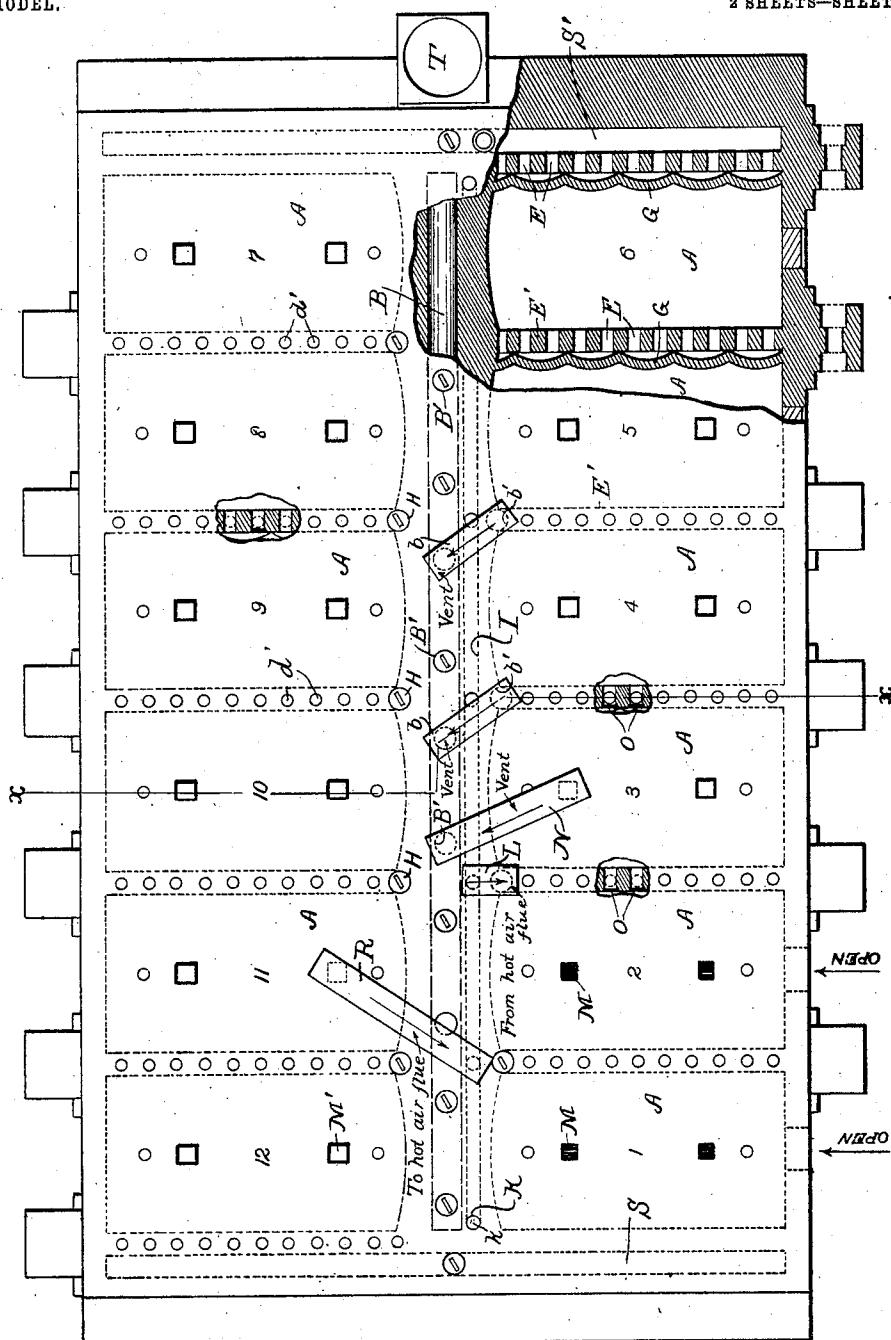
P. L. YOUNGREN.  
CONTINUOUS KILN.

APPLICATION FILED MAR. 30, 1903.

NO MODEL.

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WITNESSES:

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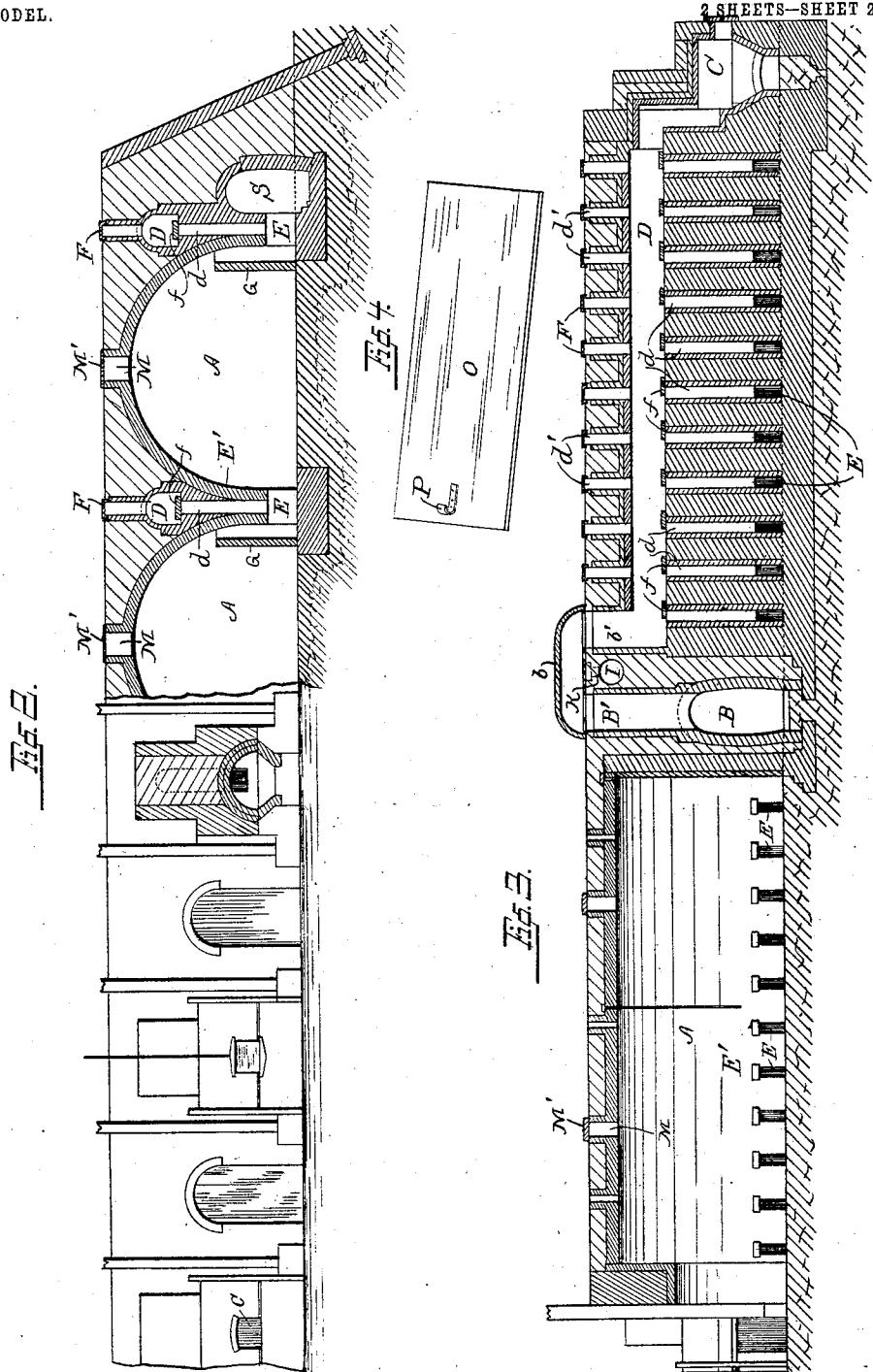
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## UNITED STATES PATENT OFFICE.

PETER L. YOUNGREN, OF MILWAUKEE, WISCONSIN.

## CONTINUOUS KILN.

SPECIFICATION forming part of Letters Patent No. 763,533, dated June 28, 1904.

Application filed March 30, 1903. Serial No. 150,150. (No model.)

*To all whom it may concern:*

Be it known that I, PETER L. YOUNGREN, a citizen of the United States, residing at Milwaukee, county of Milwaukee, and State of Wisconsin, have invented new and useful Improvements in Continuous Kilns, of which the following is a specification.

My invention relates to improvements in continuous kilns.

The object of my invention is to provide means for an adequate control and conservation of the heat, whereby the same may be fully utilized without damaging any of the bricks; and to this end my invention contemplates a preliminary conversion of the fuel into gas, with adequate facilities for keeping the flues for such gas open and also regulating the size of such openings at successive stages in the process.

My invention also contemplates utilizing the heat radiating from the finished bricks for the purpose of partially drying the green bricks with an upwardly-flowing current of hot air before subjecting them to the water-smoking process.

Other objects of the invention will be apparent from the description.

In the drawings, Figure 1 is a plan view of my invention, drawn partly in horizontal section. Fig. 2 is a partial front elevation, also showing one compartment and part of another in cross-section. Fig. 3 is a sectional view drawn on line  $xx$  of Fig. 1. Fig. 4 is an enlarged perspective view of one of the shutters.

Like parts are identified by the same reference characters throughout.

A series of compartments A are arranged in the form of a double row, with a main draft-flue B between the inner ends of the compartments of the respective rows and firing-ovens C at their outer ends. Each oven C is provided with a distributing-flue D, which leads inwardly between adjacent compartments A and may be connected with the main draft-flue B by a removable hood b, which is adapted to cover the vertically-extending apertures B' b', which lead downwardly from the top of the kiln to the main flue B and distributing-flue D, respectively. From the distributing-flues D branch flues d extend down-

wardly and communicate with connecting-passages E at the foot of the division-wall E' between the adjacent compartments A. Similar flues d', in lineal alinement with the flues d, extend upwardly from each of the flues D 55 to the top of the kiln, where they are provided with removable covers F. The flues d are provided with valves f, preferably consisting of pieces of brick or tile, in the distributing-flue D, adapted to be adjusted to 60 regulate the passage of gas into the flues d. Bag-walls G, Fig. 1, are provided in each compartment A adjacent to each connecting-passage E on the side of draft-entrance, whereby the burning gas is directed into the upper 65 portion of the compartment. Caps H are used to cover the vertical connecting-flues b' when it is desired to direct the gases downwardly through the flues d. A main hot-air flue I, located above the main draft-flue B, is provided with branch flues K, extending to the top of the kiln and provided with covers k. These flues are used to admit hot air to the flue I, as hereinafter explained, and also to connect the flue I with flues b', D, and d of 70 75 any compartment A when it is desired to admit hot air to such compartment. In the latter case the covers k and F are removed from the flues K and d' which it is desired to connect and a hood L (similar in form to the 80 hood b of the draft-flues) is adjusted over the open flues.

It will be observed that each compartment A has one or more apertures M through its top, with covers M' normally closing the same. 85 These apertures may be connected with a branch B' of the main draft-flue B by means of hoods N. It will also be observed, Fig. 4, that the shutters O are provided with hooks P. These shutters are adapted to be inserted 90 in flues d' d to close the passages E when it is desired to separate a compartment from the others.

To briefly describe the operation of the kiln, it will be assumed that the kiln has twelve 95 compartments A, as shown in Fig. 1, these being numbered from 1 to 12, inclusive. The end compartments 6 7 and 1 12 are connected by cross-flues S S'. Compartment No. 1 is open for the removal of the brick, and 100

No. 2 is also open to be filled with green brick. These two compartments are separated from No. 3 by shutters O. Compartment No. 3 is connected with the hot-air flue 5 I by a hood L, covering the connecting-flues K and l', whereby hot air is admitted to the compartment numbered 3 through the flues D d and passage E, the air being thus made to enter the bottom of such compartment. A 10 draft of hot air is maintained through this compartment by a hood N, connecting the compartment-aperture M with one of the apertures B' of the main draft-flue. Compartments A, numbered 7 and 8 in Fig. 1, are being fired—*i. e.*, a gas-producing fire is maintained in the ovens C of these compartments and the gas directed through the corresponding ducts d into the passages E leading thereto, the gas being burned in the passages and 15 compartments and the products of combustion passing therefrom in a downdraft through the bricks and by means of passages E through the compartments 6, 5, and 4. The bricks in compartment 6 will be at a red heat, those in compartment 5 will be taking color, and those in compartment 4 will be undergoing the water-smoking or drying process. Compartments numbered 4 and 5 are connected with the main draft-flue B by hoods b, connecting 20 compartments and the products of combustion passing therefrom in a downdraft through the bricks and by means of passages E through the compartments 6, 5, and 4. The bricks in compartment 6 will be at a red heat, those in compartment 5 will be taking color, and those in compartment 4 will be undergoing the water-smoking or drying process. Compartments numbered 4 and 5 are connected with the main draft-flue B by hoods b, connecting 25 compartments and the products of combustion passing therefrom in a downdraft through the bricks and by means of passages E through the compartments 6, 5, and 4. The bricks in compartment 6 will be at a red heat, those in compartment 5 will be taking color, and those in compartment 4 will be undergoing the water-smoking or drying process. Compartments numbered 4 and 5 are connected with the main draft-flue B by hoods b, connecting 30 compartments and the products of combustion passing therefrom in a downdraft through the bricks and by means of passages E through the compartments 6, 5, and 4. The bricks in compartment 6 will be at a red heat, those in compartment 5 will be taking color, and those in compartment 4 will be undergoing the water-smoking or drying process. Compartments numbered 4 and 5 are connected with the main draft-flue B by hoods b, connecting 35 compartments and the products of combustion passing therefrom in a downdraft through the bricks and by means of passages E through the compartments 6, 5, and 4. The bricks in compartment 6 will be at a red heat, those in compartment 5 will be taking color, and those in compartment 4 will be undergoing the water-smoking or drying process. Compartments numbered 4 and 5 are connected with the main draft-flue B by hoods b, connecting 40 compartments and the products of combustion passing therefrom in a downdraft through the bricks and by means of passages E through the compartments 6, 5, and 4. The bricks in compartment 6 will be at a red heat, those in compartment 5 will be taking color, and those in compartment 4 will be undergoing the water-smoking or drying process. Compartments numbered 4 and 5 are connected with the main draft-flue B by hoods b, connecting 45 compartments and the products of combustion passing therefrom in a downdraft through the bricks and by means of passages E through the compartments 6, 5, and 4. The bricks in compartment 6 will be at a red heat, those in compartment 5 will be taking color, and those in compartment 4 will be undergoing the water-smoking or drying process. Compartments numbered 4 and 5 are connected with the main draft-flue B by hoods b, connecting 50 compartments and the products of combustion passing therefrom in a downdraft through the bricks and by means of passages E through the compartments 6, 5, and 4. The bricks in compartment 6 will be at a red heat, those in compartment 5 will be taking color, and those in compartment 4 will be undergoing the water-smoking or drying process. Compartments numbered 4 and 5 are connected with the main draft-flue B by hoods b, connecting 55 compartments and the products of combustion passing therefrom in a downdraft through the bricks and by means of passages E through the compartments 6, 5, and 4. The bricks in compartment 6 will be at a red heat, those in compartment 5 will be taking color, and those in compartment 4 will be undergoing the water-smoking or drying process. Compartments numbered 4 and 5 are connected with the main draft-flue B by hoods b, connecting 60 compartments and the products of combustion passing therefrom in a downdraft through the bricks and by means of passages E through the compartments 6, 5, and 4. The bricks in compartment 6 will be at a red heat, those in compartment 5 will be taking color, and those in compartment 4 will be undergoing the water-smoking or drying process. Compartments numbered 4 and 5 are connected with the main draft-flue B by hoods b, connecting 65 compartments and the products of combustion passing therefrom in a downdraft through the bricks and by means of passages E through the compartments 6, 5, and 4.

only permits access for the purpose of adjusting the valves, but facilitates cleaning the flues. The air supplied for combustion purposes enters through the compartment 1, which is open, and passes through cross-flue 70 S to compartment 12, from which it passes through all the compartments on that side and through cross-flue S' to compartments 6, 5, and 4. By adjusting shutters across part of the passages between compartments 11 and 75 10 some of the air is deflected and passes into compartment 3, as above explained, while the remainder passes on through 10 and 9 and reaches compartment 8 in a highly-heated condition. By adjusting these shutters the 80 amount of air supplied for combustion can be accurately regulated. The heat taken up by the air in cooling the finished bricks is thus not only utilized, but the heat serves to promote combustion. Only a small quantity of 85 gas is necessary to raise the temperature to the required degree in compartments 7 and 8, and therefore sufficient surplus oxygen remains of the admitted air to prevent the reduction of the oxids in the clay. 90

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

1. In a kiln of the described class, the combination of inclosing walls forming a series of 95 brick-receiving compartments; a gas-producing oven for each compartment, communicating with a distributing-flue in the side wall of the compartment; said wall having branch flues leading downwardly from the distributing-flue and communicating with the lower portion of the compartment, and corresponding branch flues leading upwardly to the exterior, and provided with suitable removable covers. 100

2. In a kiln of the described class, the combination of inclosing walls forming a series of 110 brick-receiving compartments, having connecting-passages through the lower portions of the side walls; said side walls being provided with distributing-flues above said passages, extending longitudinally of the compartment, and branch flues communicating between the distributing-flues and said passages; a source of gas-supply for each distributing-flue; a valve for each branch flue; and shutters adapted to be inserted through the flues to close said passages. 115

3. In a kiln of the described class, the combination of inclosing walls forming a series of 120 brick-receiving compartments, having connecting-passages through the lower portions of the side walls; said side walls being provided with distributing-flues above said passages, extending longitudinally of the compartment, and branch flues communicating between the distributing-flues and said passages; a source of gas-supply for each distributing-flue; a valve for each branch flue; and shutters adapted to be inserted through the 125 flues to close said passages. 130

flues to close said passages; said kiln being also provided with a main hot-air flue, and means for separately connecting the same with any of the brick-receiving compartments.

5 4. In a kiln of the described class, a set of inclosing walls forming a series of brick-receiving compartments, having interconnecting passages, communicating between their lower portions; the walls of said kiln being 10 provided with a gas-distributing flue for each compartment, with branch flues leading to said interconnecting passages, a main draft-flue adapted to be connected interchangeably with the distributing-flues, and a hot-air flue, also 15 adapted to be connected interchangeably with the distributing-flues; valves controlling the flow of air or gas through the flues; removable shutters adapted to separately close the interconnecting passages; and a source of gas- 20 supply for each of said distributing-flues.

5 5. The combination of a set of inclosing walls forming a plural series of compartments and having passages communicating between the lower portions of the compartments in each 25 series and from the end compartments of each series to those of the adjacent series; the division-walls between the respective series being provided with a main draft-flue and a main hot-air flue and the division-walls between the 30 compartments of each series being provided with a gas-distributing flue extending between adjacent compartments substantially at right angles to the main draft-flue and above the connecting-passages between such compartments but in communication with such 35 passages by downwardly-extending branch flues; means for supplying combustible gas to each of said distributing-flues, and means for connecting each of said distributing-flues with 40 either the main hot-air flue or the main draft-flue.

6. The combination of a set of inclosing walls forming a plural series of compartments and having passages communicating between the 45 lower portions of the compartments in each series and from the end compartments of each series to those of the adjacent series, the division-walls between the respective series being provided with a main draft-flue and a main 50 hot-air flue, and the division-walls between the compartments of each series being provided with a gas-distributing flue extending between adjacent compartments substantially at right angles to the main draft-flue and above the 55 connecting-passages between such compartments, but in communication with such passages by downwardly-extending branch flues; means for supplying combustible gas to each of said distributing-flues; movable devices for 60 connecting each of said distributing-flues with either the main hot-air flue or the main draft-flue, and movable devices for connecting any

of said compartments directly with the hot-air flue.

7. In a kiln of the described class, a set of 65 inclosing walls forming a series of brick-receiving compartments having apertures leading from their upper portions to the exterior; side walls for said compartments having bottom passages communicating between the compartments; gas-supply flues having branch flues communicating with said passages and to the exterior through the top of the kiln; said kiln being also provided with a main draft-flue, and a main hot-air flue, each having branches 70 extending to the top of the kiln; covers for all said exteriorly-communicating branch flues and apertures; and connecting devices, adjustable on top of the kiln, to connect said branch flues and apertures in any desired relation of 75 intercommunication.

8. The combination of inclosing walls forming a plural series of compartments, the central division-wall between the compartments of the respective series being provided with a 80 main draft-flue and the division-walls between the compartments of each series being provided with connecting-passages in their lower portions communicating between adjacent compartments and gas-distributing flues extending inwardly from the side walls through the division-walls toward the main draft-flue and above said connecting-passages; a gas-producing oven located at the outer end of each transverse division-wall, and communicating 85 with the distributing-flue in such wall; each such wall being provided with branch flues leading downwardly to the connecting-passages and upwardly through the top wall from the distributing-flue; together with means for 90 connecting the distributing-flue with the main draft-flue.

9. In a kiln of the described class, a set of inclosing walls forming a series of interconnected brick compartments, having fuel and 105 draft flues arranged to provide for a down-draft through the bricks of several compartments in succession, from the point of firing; said kiln being also provided with other flues and passages, dampers therefor and movable 110 flue-connecting devices co-operatively arranged with the first-mentioned flues to permit a reversal of the draft through the bricks, and also arranged to direct heated air from a compartment filled with finished, but heated, 115 bricks, to another compartment filled with green bricks.

In testimony whereof I affix my signature in the presence of two witnesses.

PETER L. YOUNGREN.

Witnesses:

LEVERETT C. WHEELER,  
JAS. B. ERWIN.