

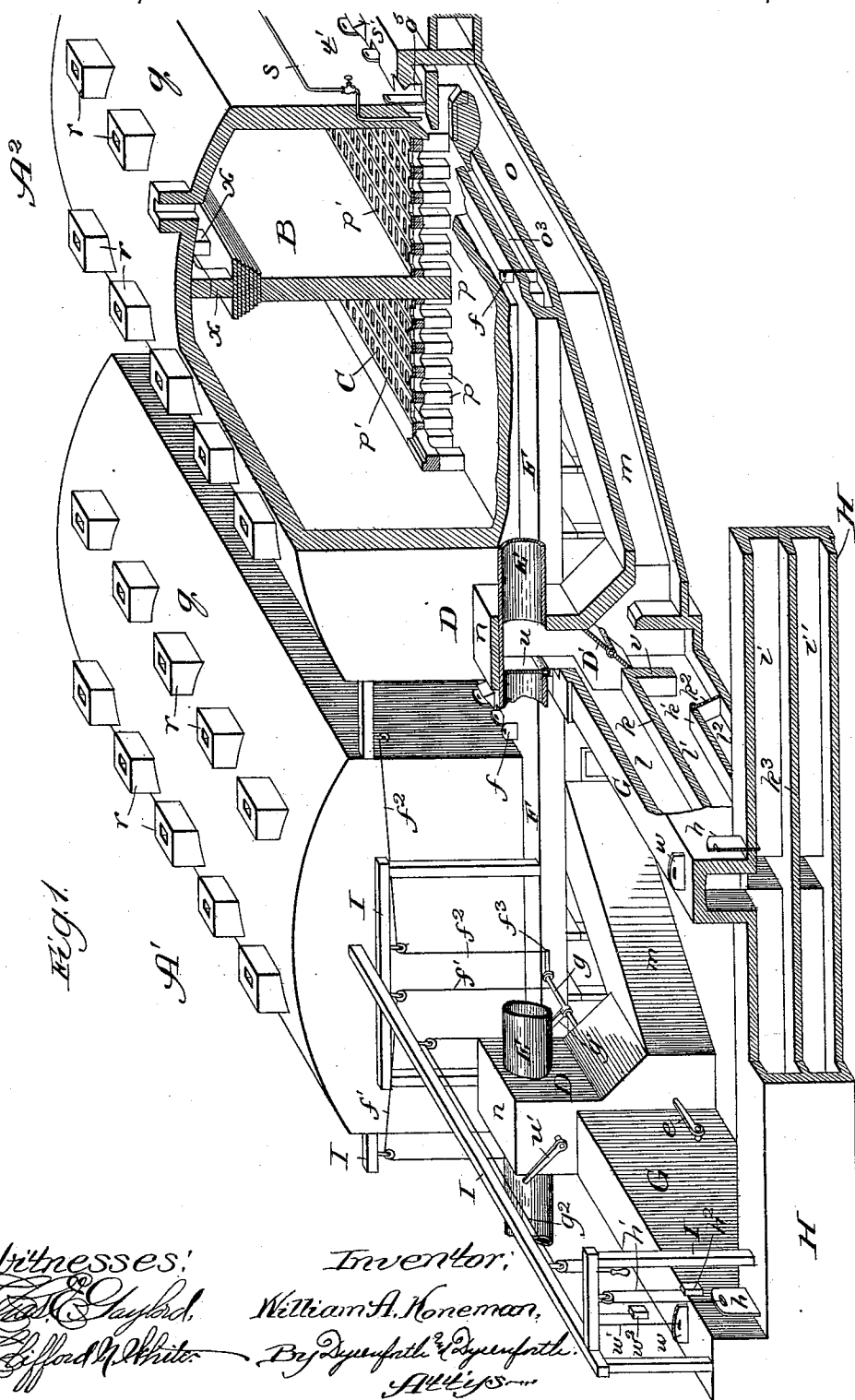
(No Model.)

4 Sheets—Sheet 1.

W. A. KONEMAN.
BRICK KILN.

No. 484,595.

Patented Oct. 18, 1892.



Witnesses:

Chas. Gaylord,
Clifford M. White.

Inventor:

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(No Model.)

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4 Sheets—Sheet 3.

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Fig. 3.

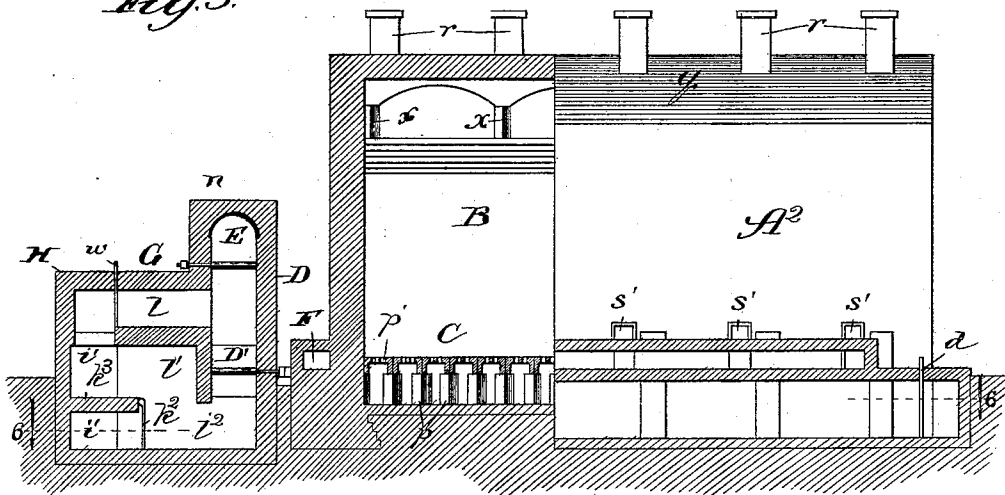
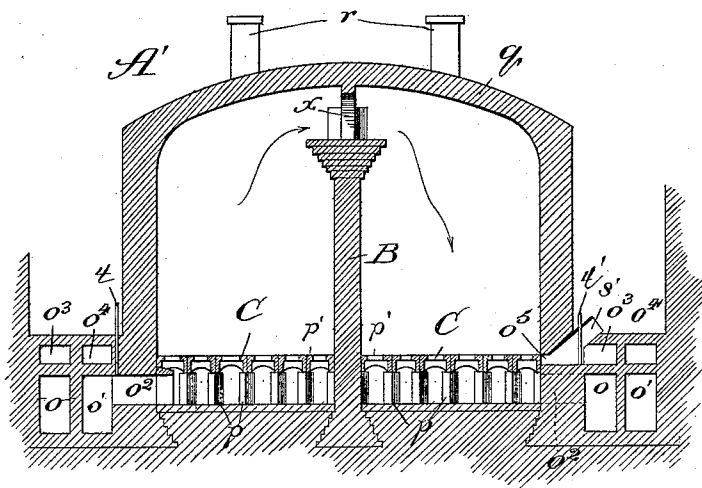


Fig. 4.



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(No Model.)

4 Sheets—Sheet 4.

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Fig. 5.

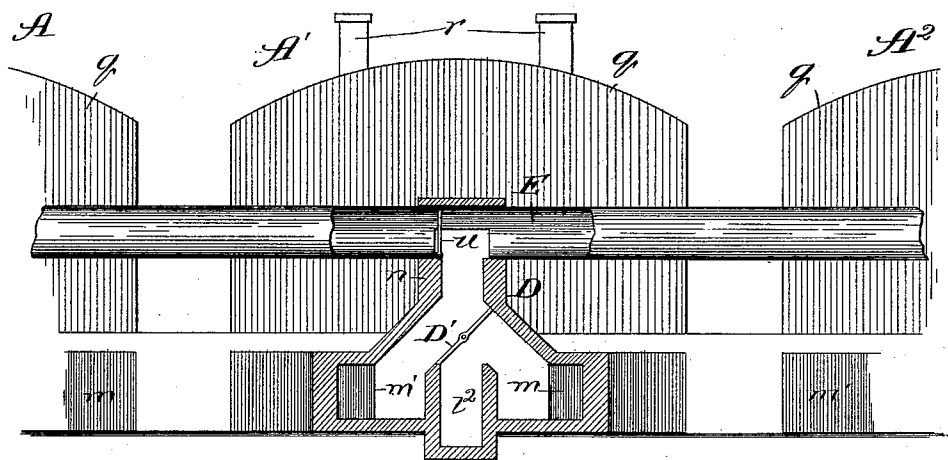
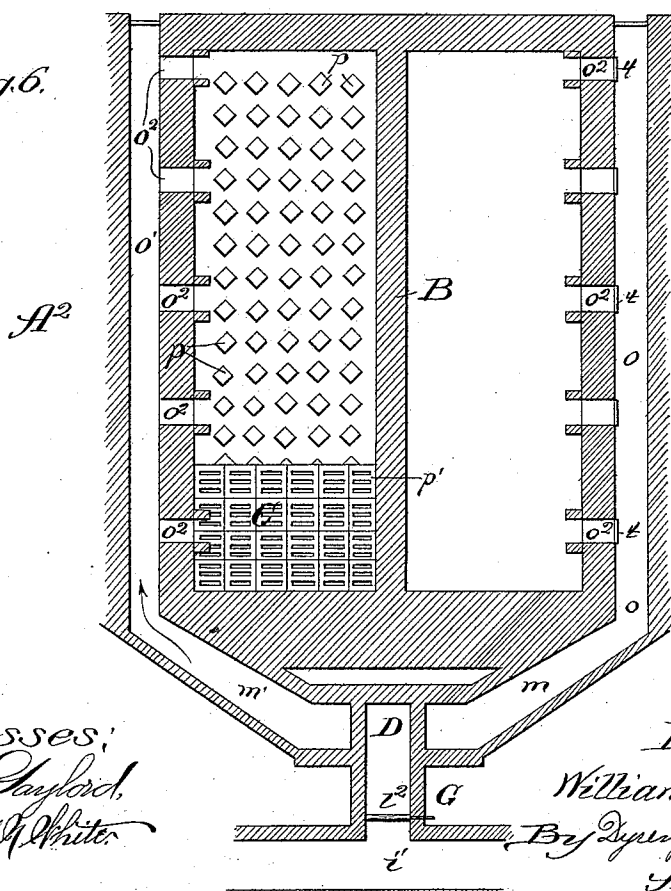


Fig. 6.



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UNITED STATES PATENT OFFICE.

WILLIAM A. KONEMAN, OF CHICAGO, ILLINOIS.

BRICK-KILN.

SPECIFICATION forming part of Letters Patent No. 484,595, dated October 18, 1892.

Application filed May 8, 1891. Serial No. 392,098. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM A. KONEMAN, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Brick-Kilns, of which the following is a specification.

The objects of my invention are to provide a construction of brick-kiln whereby the direction through the kiln of the hot products of combustion employed for the burning may be reversed at will to attain uniformity as to the burning in the product; to economize in fuel by exhausting the products of combustion of practically all their available heat in the burning operation of the kiln; to provide for the drying of green brick in one kiln or portion of the series of kilns preparatory to burning them with the waste heat of the products of combustion employed for burning in another kiln or portion of the series of kilns; to utilize the heat in a burned kiln for heating the air to be used in burning another kiln, and generally to provide an improved construction of brick-kiln.

For carrying out my first-named object my improved kiln may be single, but is divided into two intercommunicating compartments adapted to have the hot products of combustion forced through them alternately and periodically in reverse directions.

The accomplishment of my second object requires at least two controllably intercommunicating kilns to enable the waste hot products of combustion from one to give up their surplus heat to the contents of the other.

My third object presumes for its accomplishment the provision of at least three intercommunicating kilns, including the two already referred to in stating the requirement for my second named object and a third to contain brick in condition to require preparation for the burning by drying them, for which the waste hot products of combustion from the second are utilized, being reduced in temperature by abstraction of their heat in the previous operations or by mixing them with cold air to a degree adapting them to perform the drying function.

In the accompanying drawings, Figure 1 is a broken perspective view of my improved

construction of multiple brick-kiln. Fig. 2 is a broken plan view of the same representing four of the kilns in the system. Figs. 3, 4, and 5 are sectional views taken, respectively, on the lines 3 3, 4 4, and 5 5 of Fig. 2 and viewed in the directions indicated by the arrows. Fig. 6 is a section taken on the line 6 6 of Fig. 3 and viewed in the direction of the arrows.

As represented, my improved kiln employs fuel-gas as the fuel, though I do not wish to be understood as limiting its use to any particular kind of fuel.

Whatever the number of kilns employed in my system they all involve the same construction, so that description thereof with relation to one will suffice to explain that of each.

Each kiln, (whether that denoted by A, A', A², or A³), though it may involve any desired form, is preferably of that illustrated—namely, a rectangular oblong structure having an arched roof or crown *g*, provided with several ventilating and air-inlet chimneys *r*, adapted to be closed by suitable caps (not shown) or by inserting a plug (brick) into each. The kiln is divided into two compartments by a fire-brick or other incombustible vertical partition B, extending from the base of the structure short of the crown, which is propped from the partition by spaced brick *x*. (See Fig. 1.) The floor C of the kiln is formed with preferably rectangular piers *p* of fire-clay, placed at suitable intervals on the bases of the compartments and disposed in a manner to present their corners to each other and to the course of the fuel, as clearly represented in Fig. 6, thereby to reduce to the minimum their obstruction of the flow of the fuel fluids passed through the kiln, as hereinafter described. The piers *p* form, as it were, an open-work foundation of the floor, the surface thereof being afforded by rectangular fire-tile *p'*, having elongated vertical openings through them and of which one is imposed on and supported by each of four adjacent piers *p*, as indicated in Fig. 6. Upon the floor C are piled to or about to the height of the partition B the brick to be burned. (Not shown.) At the opposite outer sides of the base of the kiln and extending throughout its length are flues *o* and *o'*, (see Fig.

6,) from which branch passages or ports o^2 lead at intervals horizontally into the compartments at opposite sides of the partition B below the floor C. The flues o and o' are
 5 surmounted by air-flues o^3 and o^4 , forming branches of a main air-flue F, extending horizontally along the front side of the kiln and provided with branch passages o^5 , leading into the kiln. As will be clear from the drawings, the members of the series of kilns being
 10 side by side, with a space between each pair, that space is occupied by a conduit divided longitudinally into two pairs of the said flues—namely, the flues o o' for one kiln and
 15 the flues o^3 and o^4 for the adjacent one. In front at the center of one end of the kiln is a distributing-chamber D, widening laterally toward its base and into a side of the crown n of which leads the pipe E for conveying
 20 gaseous fuel. (Preferably fuel-gas from a producer not shown.) From opposite sides of the base of the chamber D flues m and m' lead obliquely into the flues o and o' , respectively. The chamber D is extended at the
 25 front side thereof into a short conduit G, divided longitudinally into three flues l , l' , and l^2 , one above the other, by diaphragms k and k' , the former having a vertical downward extension v at its rear end, terminating near
 30 the level of the diaphragm k' , and the latter, which reaches backward short of the diaphragm extension v , carrying at its extremity a hinged valve k^2 , adjustable to extend vertically and form an obstruction across the
 35 flue l^2 , as shown in Fig. 1, and also to extend upward through and form an obstruction across the flue l' , thereby opening the flue l^2 .
 H is a conduit extending horizontally along the front of the kiln and divided lengthwise
 40 by a horizontal diaphragm k^3 into flues i and i' , the lower of which leads to the stack, (not shown,) while the upper one serves a purpose only in connection with a series of kilns, which is likewise the case with all but the flue l^2 of
 45 the flues in the conduit G, the function of the others being hereinafter explained in describing the manner of using the waste heat from one kiln in another, upon which function the reversing of the direction of the products of
 50 combustion in one and the same kiln is not dependent, that being capable of accomplishment without such details. It may be here stated, however, that the flues l' and l^2 lead,
 55 respectively, into the flues i and i' , and that the flue l is on a higher plane than the conduit H, but leads into the flue i of the latter, its communication therewith, however, being controllable through the medium of a vertically-sliding valve w .
 60 In the chamber D is journaled a deflecting-valve D' .

As shown in Fig. 1, the fuel-supply pipe E opens into the crown n of the chamber D and passes thence through the flues m and o or
 65 through the flues m' and o' into the kiln by way of the side openings o^2 , whichever of the

said pairs of flues it enters for access to the kiln, depending on the position of setting the valve D' . If it be set as represented, the fuel-gas will pass into the kiln at its base by way
 70 of the flues m' and o' , and on entering the kiln (the vertically-adjustable slide-valves t of the ports o^2 and t' of the air-inlet ports o^2 at the sides of the kiln being previously raised for the free passage) it encounters the air
 75 supply from the main air-flue F and branch flue o^4 and is ignited. For kindling the fuel I provide any suitable means, such as an oil-pipe s , leading from a hydrocarbon oil-supply (not shown) by its branches to different
 80 points of ignition, where the fire for the purpose may be introduced through oblique openings s' (provided in both sides of the kiln) at the side where the fuel-gas and air enter the kiln. The burning fuel thus enters
 85 between the piers of the floor C of one compartment of the kiln, passes upward through the floor and pile of brick therein over the partition B, and down through the pile of brick in the adjacent chamber through the floor C,
 90 ports o^2 , and flues o , m , and l^2 (the latter being then unobstructed by the valve k^2) into the flue i' , and thence, if, as presupposed, the burning be performed in a single kiln, directly
 95 to the stack. As the intensity of the heat of the products of combustion obviously lessens in their course toward the outlet side of the kiln, unless otherwise provided against
 100 there would be lack of uniformity in the burned product, the brick nearer the fuel-inlet being better burned than those toward the outlet. This lack in uniformity I prevent by
 105 periodically (say every hour or so) turning the valve D' to its opposite positions, thereby alternately directing the products of combustion into opposite sides of the base of the
 110 kiln, and thus reversing their course through the latter. This reversal may be produced by means other than the valve D' . Hence I do not limit my improvement thereto.

As hereinbefore mentioned, to secure all the advantages of my improved kiln construction a series of controllably-intercommunicating kilns is provided, as represented in the
 115 drawings, and though two may be used at one time with advantage in the way of economizing in fuel by using all or practically all of the heat-units thereof, at least three in operation
 120 at one time afford the greater advantage in the respect stated. Thus while one kiln is burning the waste heat therefrom may be used in burning another, and from the latter the still hot products of combustion, though
 125 so reduced in temperature as to be inadequate for burning, may be passed through a kiln of green brick to dry them preparatory
 130 to burning. If, as is intended and represented in Fig. 2, a fourth kiln be included in the series, the one in which the burning is finished may be utilized to heat the air used in
 burning another, and the arrangement illustrated is designed for that purpose.

As already stated, all the kilns involve the construction of that hereinbefore described in detail, though it should be stated that the conduit H crosses and communicates with the conduits G of the chambers D of all. Furthermore, various controlling-valves require description. In the fuel-supply pipe E, in which the course of the fuel is indicated by an arrow in Fig. 1, are dampers u , one being provided at the farther side of each flue G and controlled from the front side of the crown n by a handle w' on its projecting axis to close the passage into the conduit G, in order to allow the fuel-supply to pass by it or open such passage by closing that in the pipe E to permit the fuel-gas to enter the desired said conduit G, and thence the particular kiln to which it belongs. Each kiln has erected on its front portion a suitable frame I, (see Fig. 1,) on which to suspend the cables sustaining various valves. Thus the slide-valve w in each passage l of an extension G is suspended on a cable w' , carrying a counterbalancing-weight w^2 . In the flue i of the conduit H at the farther side of the upper flue portion of each conduit G is a slide-valve h , suspended from the frame I by a cable h' , carrying a counterbalancing-weight h^2 . A cable g^2 , passes from an accessible position over guide-pulleys on the frame to and is connected with the weighted end of a crank-arm g' on the axis g of the valve D' , said axis also extending transversely through the air-flue F, and carrying a damper therein open, with the valve D' in the position illustrated, said axis also carrying a cross-head f^3 , connected from opposite ends by cables f^2 and f' , passing over guide-pulleys on the frame, with slide-valves f at the outer ends of the branch air-flues o^3 and o^4 at opposite sides of the kiln, and the valve k^2 in the conduit G is controllable for setting it by a crank-arm e on the protruding end of its axis.

The air-flue F need not extend lengthwise beyond the ends of the front side of the series of kilns, and the same is true of the upper flue i in the conduit H, while the lower flue i' extends to the stack and has a branch passage i^2 , extending along the side of the end kiln nearest the stack and back of the entire series of kilns, as shown in Fig. 2, thus crossing at the back of the kilns the branch flues o and o' , communication with which is controlled through the medium of the vertical slide-valves d . In the branch flue i^2 , near its junction with the main stack-flue i' , is a fan K, and at said junction in the flue i' is a vertical slide-valve i^3 .

To enable the operation to be understood, it may be presumed that the burning of the contents of the first kiln A has been finished, that the contents of the kiln A', having been partly burned by the waste heat of the products of combustion utilized in the first kiln, are now being burned by an original supply to it of fuel, that the contents of the third

kiln A² are being partly or preparatorily burned by the waste heat of the original products of combustion utilized in the second kiln, that said products of combustion are 70 passed thence, greatly reduced as to temperature, upward through the fourth kiln A³ to dry green brick therein, and thus prepare them for burning, and that the air-supply is furnished in a heated condition to the main 75 air-flue F by opening the chimneys in the crown of the first kiln A, and by the draft drawing air by way of said chimneys through the hot kiln A into the flue F. To accomplish this result, the valve D' in the chamber D of 80 the kiln A' may be supposed to be set in the position of that of the kiln A² in Fig. 1. Then the valves u in the gas-pipe E at the kilns A³ and A² will be down, there to close the supply to the respective chambers D, 85 while that valve of the kiln A' will be raised to admit the gas to its chamber D and obstruct its passage beyond the same. The gas will then pass through the flues m' and o' of the kiln A' into that kiln (where it is 90 ignited, as hereinbefore described) through the open ports o^2 , the products of combustion thence rising in the one compartment therein, passing over its partition B down the other compartment out of the ports o^2 on that side 95 into the branch flues o and m and thence entering the flue i . The valve h of the flue i at the next kiln A² is then supposed to be down (not raised, as shown in Fig. 1) and the valve w thereof raised, the former to stop the 100 products of combustion from passing the flue l of the kiln A² and the latter to admit them therein, the valve k^2 in the respective conduit G being then raised to obstruct the flue l' , so that the products of combustion can only enter 105 the flue l . From the latter the waste products of combustion enter and pass through the kiln A² in the same manner as they were passed through the kiln A', and they exhaust by way of the respective flues o , m , and l^3 into 110 the flue i' . Thence, if there is no green-brick kiln to be dried, the succeeding valves h being raised, they may pass to the stack. If, however, they are to be used for drying green brick in the kiln A³, the final valve h is lowered, the valve i^3 raised, and the fan K operated to draw and force the spent products of combustion into the flue i^2 , the valves d in 115 the flues o and o' of the kiln A³ being then raised to permit the waste products of combustion to enter the said kiln by way of them and the ports o^2 , and pass upward through the kiln and out of its crown at the venting-chimneys r thereof.

At the start of the operation just described 125 the chimneys r in the first or burned kiln A are open to enable air to be drawn through that kiln and out of it by way of the ports o^5 and branch air-flues o^3 and o^4 in a heated condition into the main air-flue F, through which 130 it passes in the same direction as the gas into the kiln A' through the flue o^3 or o^4 , as the

case may be, (depending on the direction of entrance of the gas,) and the ports o^5 , the proper valve f being raised to admit it.

When the kiln A' has been burned, the order of burning is advanced one kiln, the first then being emptied of its cold and finished brick and filled with green ones to be dried, and so on, successively completing the burning in each kiln throughout the series. The proper setting of the valves in each case will from the foregoing description be manifest to those skilled in the art.

What I claim as new, and desire to secure by Letters Patent, is—

1. In combination, a brick-kiln containing a partition B, dividing it into communicating compartments over the partition, flues o and o' at opposite sides of the base of the kiln and communicating through ports o^2 with the compartments, a distributing-chamber D at the end of the kiln, flues m and m' , leading from opposite sides of the said chambers into the flues o and o' , an exhaust-flue leading from the chamber D and common to all the other flues, a fuel-supply conduit E, leading into the said chamber, and a valve D' in the chamber between the flues m and m' and adjustable to close either at will to the fuel-supply, and thereby open the other to the exhaust-flue, whereby the course of the products of combustion through the kiln may be reversed, substantially as described.

2. In a brick-kiln, the floor comprising piers p , disposed with their corners diagonally opposing each other, with perforate fire-brick imposed thereon, substantially as described.

3. In combination, a brick-kiln containing a partition B, dividing it into communicating compartments, each having its floor formed with piers p , disposed with their corners diagonally opposing each other and perforate fire-brick imposed thereon, flues o and o' at opposite sides of the base of the kiln and communicating through ports o^2 with the compartments, a distributing-chamber D between and communicating with said flues, a fuel-supply conduit E, leading into said chamber, and a valve D' in the chamber between the flues and adjustable to close either to the fuel-supply, and thereby open the other thereto, whereby the course of the products of combustion through the kiln may be reversed at will, substantially as described.

4. In combination, a series of brick-kilns having air-inlet openings and provided with flues intercommunicating with them and with the fuel-supply, and a main air-flue for the kilns, communicating with the latter through branch flues, whereby the air to be used in a kiln to be burned may be introduced therein in a heated condition through a previously-burned kiln into the main air-flue, substantially as described.

5. In combination, a series of brick-kilns provided with vent-openings and each con-

taining a partition dividing it into intercommunicating compartments, fuel-flues communicating with the said compartments at opposite sides of the kiln and surmounted by similarly-communicating branch air-flues, a main air-flue for the kilns, into which the branch air-flues lead, a fuel-supply conduit communicating with the said fuel-flues, and a valve between the fuel-supply conduit and fuel-flues of each kiln and adjustable to reverse at will the fuel-supply to the kiln, substantially as and for the purpose set forth.

6. In combination, a series of brick-kilns, each containing a partition B, dividing it into intercommunicating compartments, flues o and o' at opposite sides of each kiln and communicating with the compartments therein, a distributing-chamber D at one end of each kiln, flues i and i' , extending across the chambers D, the flue i' , leading to the stack, flues l and l' , leading from each distributing-chamber into the flue i , and a flue l^2 , leading therefrom into the flue i' , a fuel-supply conduit E, controllably communicating with the chambers D, a valve D' in each said chamber, adjustable to direct the fuel-supply into either side of the kiln at will, and valves for the several flues, substantially as and for the purpose set forth.

7. In combination, a series of brick-kilns provided with vent-openings and each containing a partition B, dividing it into intercommunicating compartments, flues o and o' at opposite sides of each kiln and communicating with the compartments therein, a distributing-chamber D at one end of each kiln, flues i and i' , extending across the chambers D, the flue i' , leading to the stack, flues l and l' , leading from each distributing-chamber into the flue i , and a flue l^2 , leading therefrom into the flue i' , a branch flue i^2 , leading from the flue i across and controllably communicating with the flues o and o' at the ends of the kilns opposite those having the distributing-chambers, a fan K between the flues i' and i^2 , a fuel-supply conduit E, controllably communicating with the chambers D, a valve D' in each said chamber, adjustable to direct the fuel-supply into either side of the kiln at will, and valves for the several flues, substantially as and for the purpose set forth.

8. In combination, a series of brick-kilns provided with vent-openings in their roofs and each containing a partition B, dividing it into intercommunicating compartments, flues o and o' at opposite sides of the base of each kiln and leading into the said compartments through ports o^2 , a main air-flue F for the several kilns, having branch flues o^3 and o^4 , surmounting the flues o and o' and leading into said compartments through ports o^5 , a distributing-chamber D in front of each kiln, having lateral flues m and m' , leading obliquely into the flues o and o' , a fuel-supply conduit E, controllably communicating with the chambers D, a valve D' in each said cham-

ber, adjustable to direct the fuel into either flue *m* or *m'* at will, an exhaust-flue *i'*, common to all the kilns surmounted by a flue *i'*, and having a branch flue *i²*, communicating
5 with the flues *o* and *o'* at the rear of the series of kilns, a fan *K* between the flue *i'* and branch flue *i²*, flues *l* and *l'*, leading from each chamber *D* into the flue *i*, and a flue *l²*, leading therefrom into the flue *i'*, and valves for

controlling the several flue-passages at will, the whole being constructed and arranged to operate substantially as and for the purpose set forth.

WILLIAM A. KONEMAN.

In presence of—

J. W. DRYENFORTH,

M. J. FROST.