

(No Model.)

W. N. GRAVES.

4 Sheets—Sheet 1.

BRICK KILN.

No. 266,959.

Patented Oct. 31, 1882.

Fig. 1.

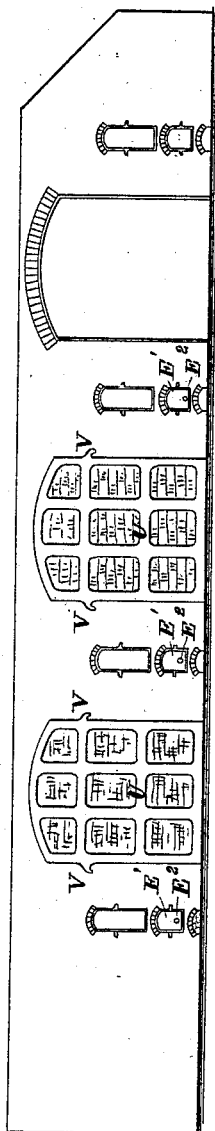
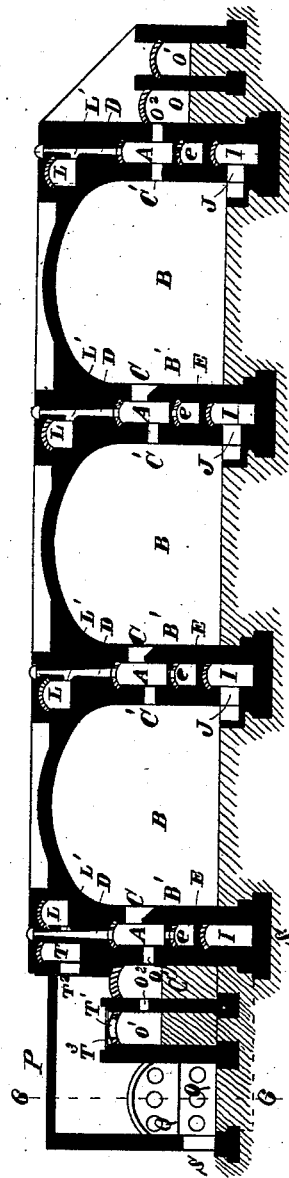


Fig. 2.



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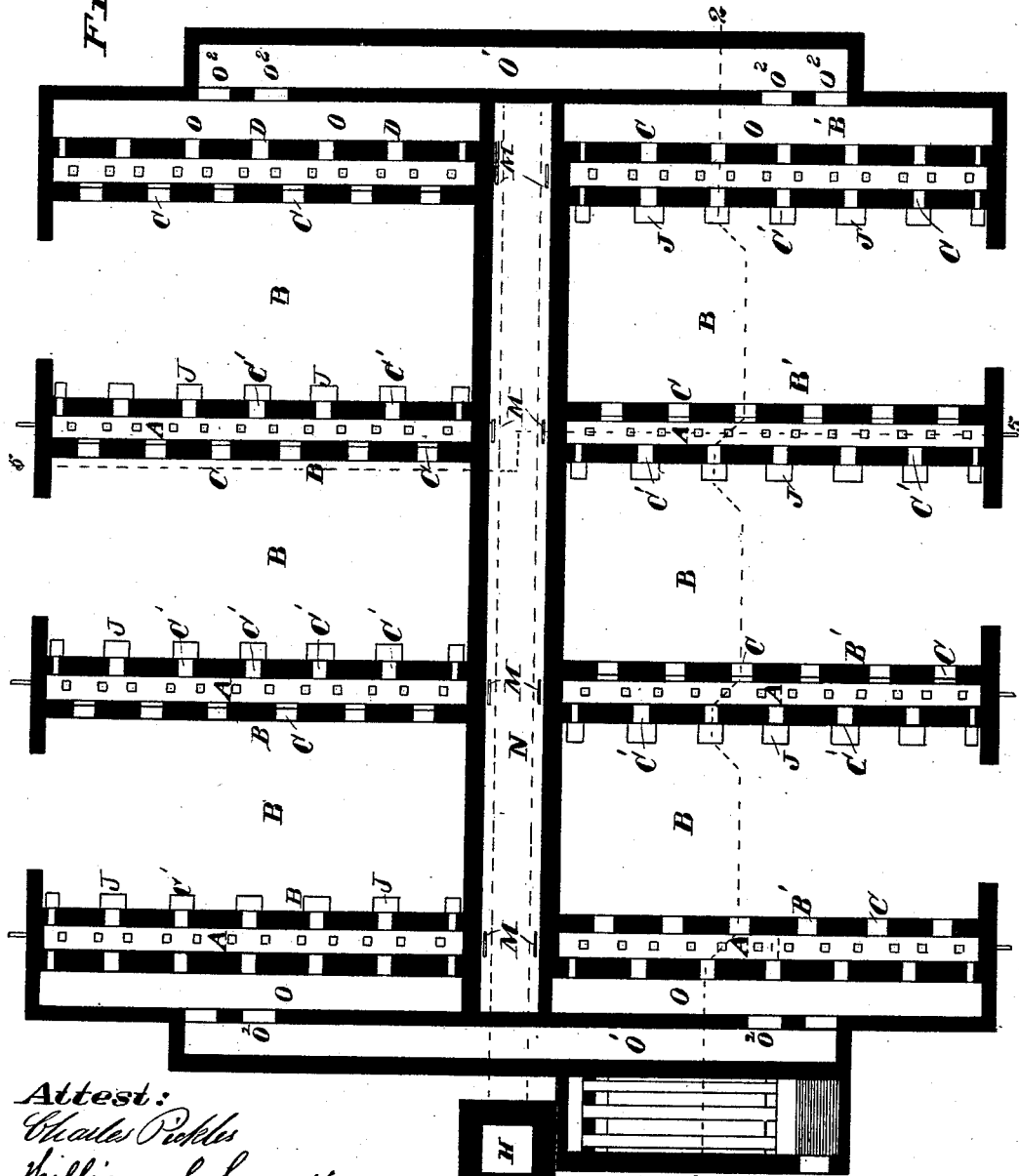
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Fig. 3.



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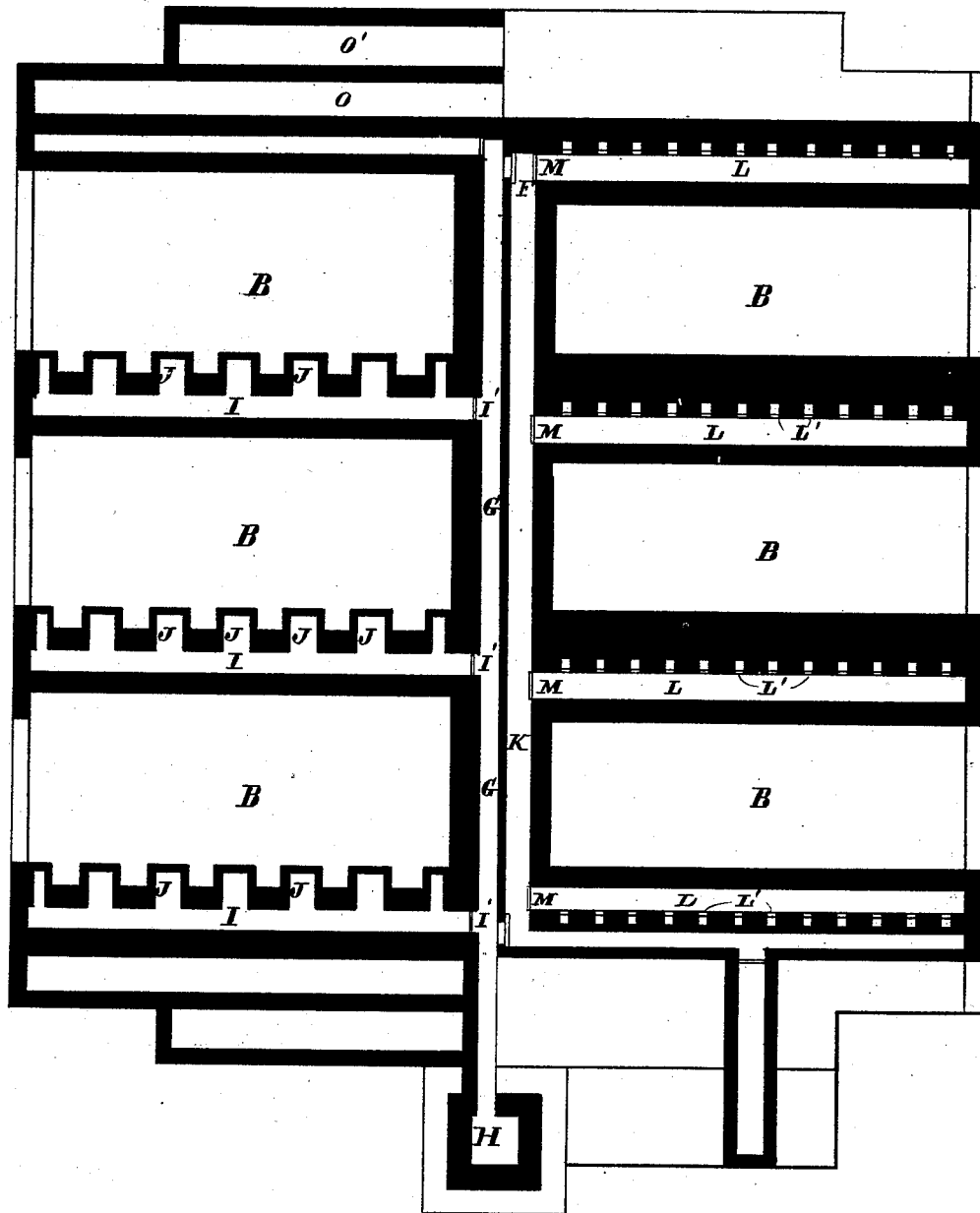
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*Fig. 4.*



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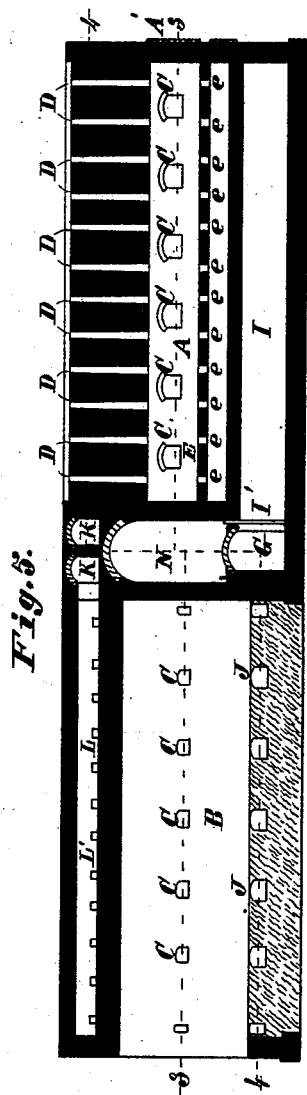
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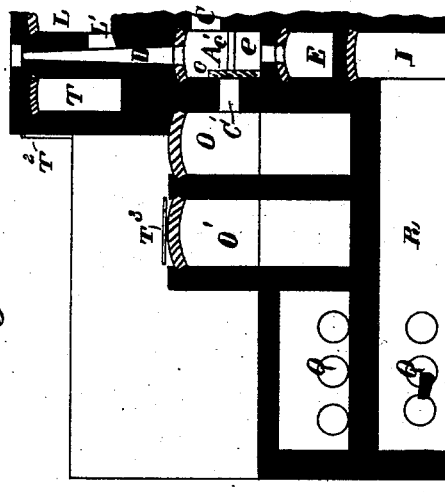
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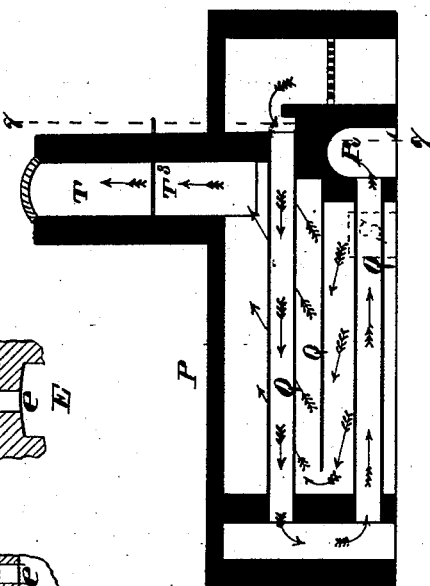
Patented Oct. 31, 1882.



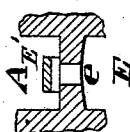
**Fig. 7.**



**Fig. 6.**



**Fig. 9.**



**Fig. 8.**



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# UNITED STATES PATENT OFFICE.

WILLIS N. GRAVES, OF ST. LOUIS, MISSOURI, ASSIGNOR OF ONE-HALF TO  
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## BRICK-KILN.

SPECIFICATION forming part of Letters Patent No. 266,959, dated October 31, 1882.

Application filed June 14, 1882. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIS N. GRAVES, of the city of St. Louis, in the State of Missouri, have invented a certain new and useful Improvement in Brick-Kilns, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, and in which—

Figure 1 is a front view. Fig. 2 is a section on line 2 2, Fig. 3. Fig. 3 is a section on line 3 3, Fig. 5. Fig. 4 is a section on line 4 4, Fig. 5. Fig. 5 is a section on line 5 5, Fig. 3. Fig. 6 is a section on line 6 6, Fig. 2. Fig. 7 is a section on line 7 7, Fig. 6, and Figs. 8 and 9 are detail views enlarged.

This invention relates to certain improvements in that class of brick-kilns composed of one or more longitudinal series of drying and burning chambers, which communicate together, so that when the fire is once started it can be kept continually burning by being transferred from one chamber to another as the operation of burning the bricks progresses through the series of chambers; and this invention consists in the various novel arrangements of air-heating furnaces, fire-chambers, ash-pits, flues, dampers, and connections, as hereinafter more fully described, for utilizing all the heat from the fuel as well as that from the chamber of bricks already burned in drying and burning a greater or less number of the succeeding chambers of bricks.

In my improved construction the firing or combustion chambers A are arranged in the pier-walls B', which divide the different kiln-chambers B, and these firing-chambers extend the whole length of the wall and discharge the heat and products of combustion directly into their respective kiln-chambers through arched openings C, and they are respectively connected with the kiln-chambers preceding them by openings C'. The said firing or combustion chambers are fed with fuel from the top of the kiln through a series of small openings, D, which extend from the top of the kiln down to the firing-chambers. These fuel-openings taper upward, as shown, to prevent the lodgment or sticking of the fuel in them. Beneath the firing-chambers are arranged the ash-pits E, the two communicating by means of small open-

ings e, which are directly beneath the openings D.

It is designed to use coal as fuel in this kiln, which is fed gradually in small quantities through the openings D into the combustion-chambers. It is also designed to use gas as fuel in place of coal, in which case the gas would be introduced into the ash-pits E through suitable pipes, and there would be fire-bricks and tile E' arranged over the openings e, (see Figs. 8 and 9,) so as to diffuse the gas so it would mingle more perfectly with the air, necessary for its combustion which enters through openings C'.

It is preferred to arrange two series of kiln-chambers side by side, with the main flues arranged between them, and it is evident that any number of kiln-chambers can be arranged in each series. Each kiln-chamber communicates with the main flue G of the chimney H by means of a branch flue, I, and opening J, and the branch flues I are provided with dampers I', to control the communication with the main flue. The openings J may also be provided with dampers to control the passage of air.

K K are the main top flues, which have communication with each kiln-chamber through branch flues L and openings L', which open into the feed-openings D, and the communication between the flues K L is controlled by dampers M.

N is an open passage-way between the two series of kiln-chambers. The two series of kilns are connected together at each end by means of cross-flues. These are preferably constructed with a separate flue, O, for each series of kiln-chambers, which communicate at or near their centers with a connecting-flue, O', by means of openings O<sup>2</sup>. (See Fig. 3.)

P is an air-heating furnace, the products of combustion from which, after passing through the heating-tubes Q, are discharged into the flues I G of the kiln through the flue or passage R. The air enters the heating-chamber at its lowest point at S, and, passing up between the tubes Q, is heated and carried by flues T into the main top flues K of the kiln, or it may be discharged directly into the first kiln-chamber of the series through flues O' O and passages T' O<sup>2</sup>, as shown in Fig. 2.

T<sup>2</sup> T<sup>3</sup> are dampers for controlling the direction in which the heated air passes. As shown, (see Fig. 3,) the openings C' C alternate, so that the air for combustion entering through openings C' will not pass directly across the combustion-chamber, but will be deflected and mingled with the gaseous matter arising from the fuel, so as to cause a perfect combustion of the fuel. After one kiln has been burned the air for combustion of the fuel of the next chamber is drawn through the incandescent mass of bricks in said chamber, and thus is heated to a very high degree before reaching the fire, and therefore will cause a more perfect combustion of the fuel.

A portion of the heated air from one or more combustion-chambers behind the one that is burning passes up through the feed-openings D into the branch top flue, L, and from thence through main top flues, K, into any one of the kiln-chambers, which may be filled with green brick required to be dried, the direction in which said heated air passes being controlled by the dampers M. Thus the surplus heat in a chamber of burned bricks is made use of for drying bricks in another chamber. The heated gases from a combustion-chamber may be caused to pass through one or more kiln-chambers by means of openings C' C through the bricks being burned, discharging through openings J into flue I, and from thence through main flue G to the uptake or chimney H.

The purpose of the air-heating furnace P is to heat air for use in drying the bricks when the kiln is first started, and thus assisting in drying the green bricks in any one of the kiln-chambers, its flow being directed by the flues and dampers, as described. This air-heating furnace is designed to be used where there is not enough specific heat in one chamber of burned bricks to effectually dry another chamber of green bricks, and at the same time to heat to the proper degree the air required for the combustion of the fuel used for burning another chamber or chambers of bricks. It is also intended to be used for drying the first chamber of bricks, and another use is that the hot air therefrom can be made use of, when gas is being used as a fuel, to assist thorough combustion by being discharged directly into the firing-chamber of the kiln being burned through flues K L.

The doors U of the kiln-chambers are formed of fire-brick, built in an iron frame, which is provided with side lugs, V, so that it can be handled by a traveling crane in carrying it from one kiln to another.

Air for the combustion of the coke formed in the firing-chamber A, and of any fuel which drops through the openings *e* into the ash-pit E, is introduced through a hole, E<sup>2</sup>, in the ash-pit door E. The openings *e* being directly beneath the feed-openings D, they can be readily reached and cleared of any obstructions from the top of the kiln by means of a rod introduced through the openings D.

Any one of the kilns may be closed from all communication with the others by closing the opening C' by means of a door, *c*, and prop *c'*. (See Fig. 7.)

I claim as my invention—

1. In a brick-kiln, the fire-chambers arranged in the pier-walls between the kiln-chambers, in combination with feed-openings extending down from the top of the kiln, substantially as shown and described.
2. The arrangement of firing-chamber A, arranged in the pier-walls between the kiln-chambers, ash-pit E, tapering feed-openings D, and air-openings *e*, substantially as described.
3. The series of kiln-chambers arranged side by side and having independent end flues, O, which are connected by cross-flues O', substantially as set forth.
4. The air-heating furnace P, in combination with the top flues, K, branch flues L, provided with dampers M, openings L', feed-openings D, combustion-chambers A, openings C' C, and kiln-chambers B, substantially as and for the purpose set forth.
5. The combination of air-heating furnace P, flue T, flues K, branch flues L, feed-openings D, and combustion-chambers A, the hot air from the furnace being used to assist combustion when gas is used as a fuel, as set forth.

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Witnesses:

SAML. KNIGHT,  
GEO. H. KNIGHT.