

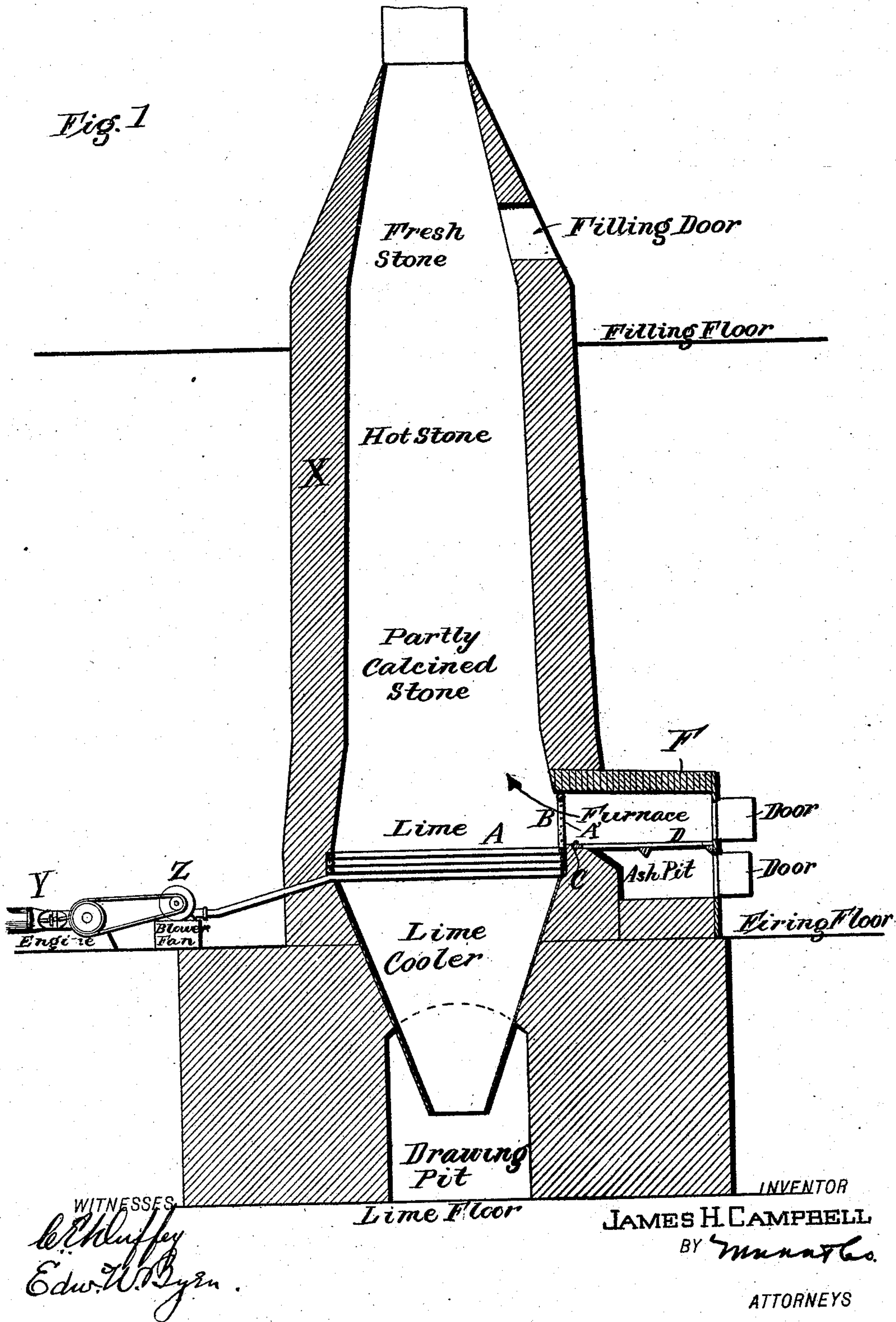
No. 858,951.

PATENTED JULY 2, 1907.

J. H. CAMPBELL.  
LIMEKILN.

APPLICATION FILED FEB. 5, 1907.

3 SHEETS—SHEET 1.



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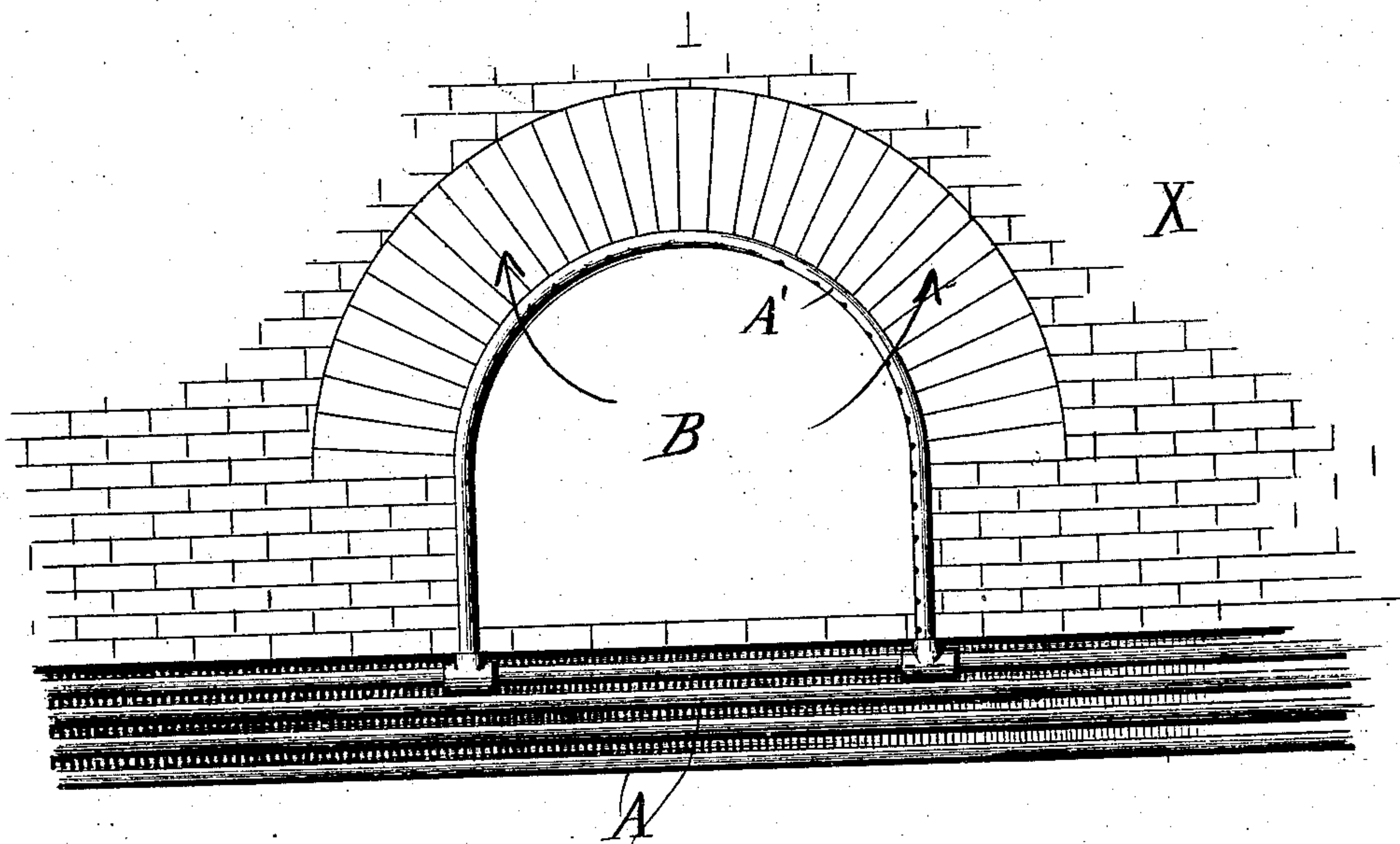
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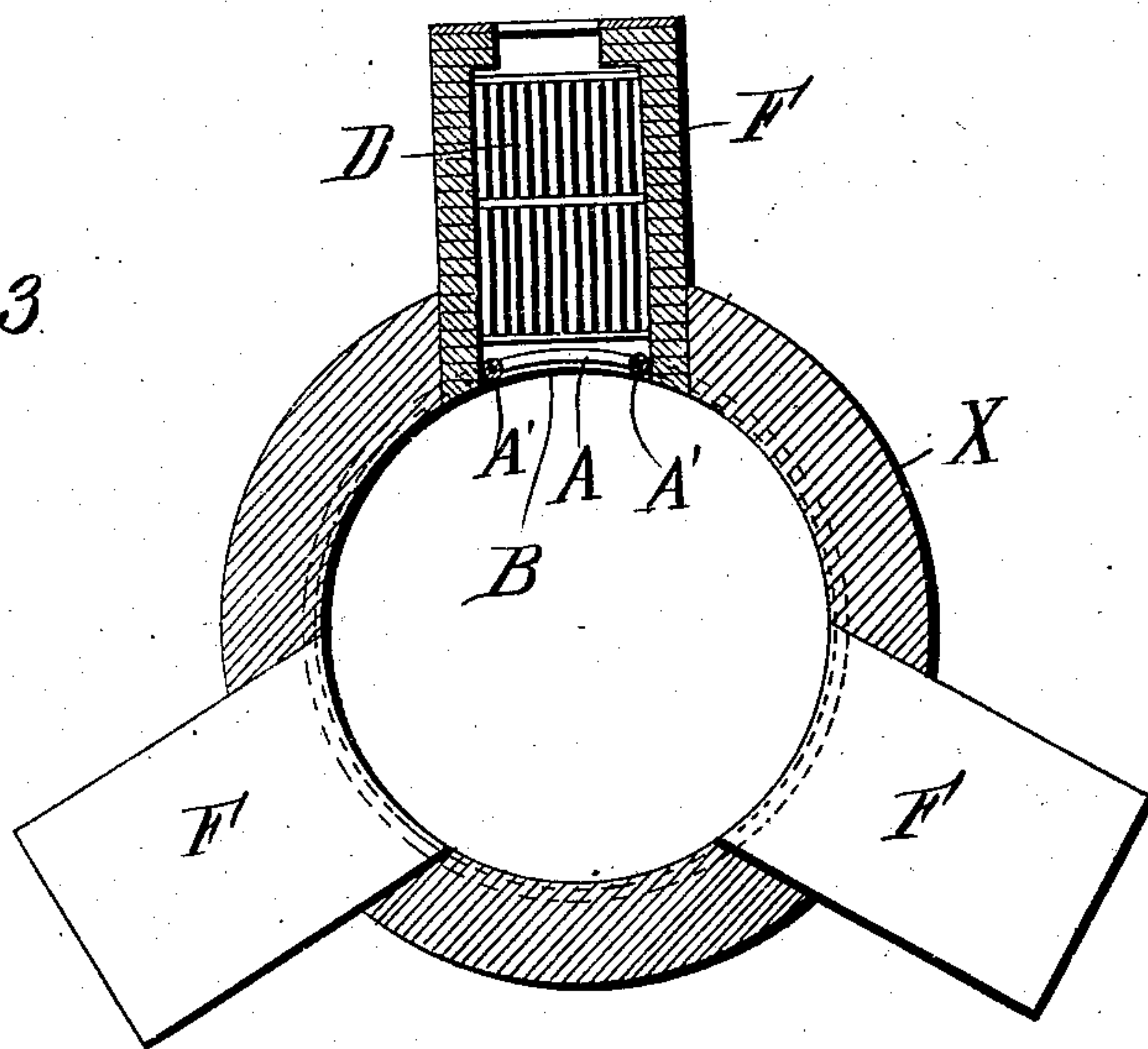
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3 SHEETS—SHEET 2.

*Fig. 2*



*Fig. 3*



WITNESSES

*W. H. Huffer*  
*Edw. W. Byrnes*

INVENTOR  
JAMES H. CAMPBELL

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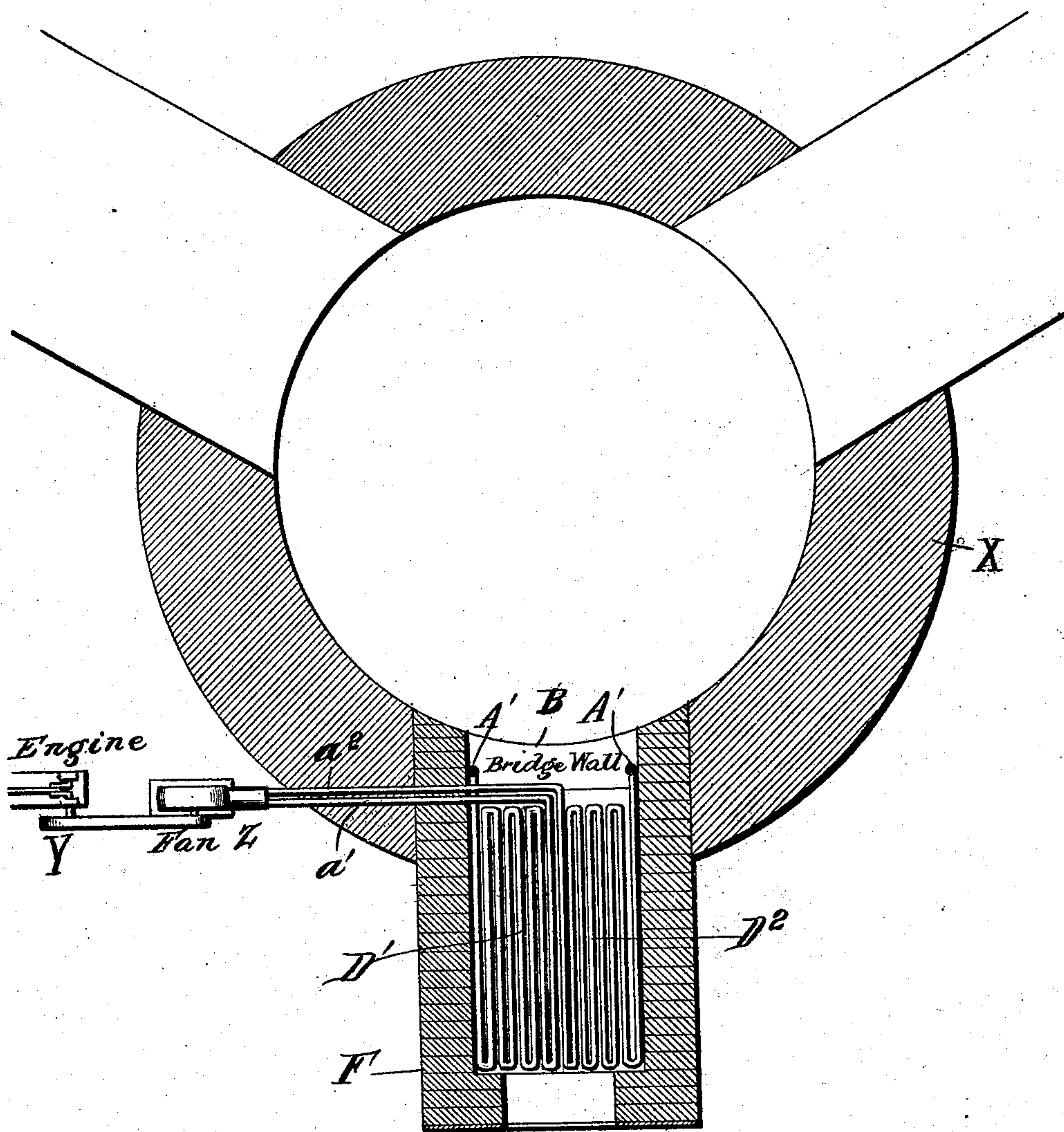
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3 SHEETS—SHEET 3.

*Fig. 4*



WITNESSES  
*W. P. Cluff*  
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INVENTOR  
JAMES H. CAMPBELL  
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# UNITED STATES PATENT OFFICE.

JAMES HUBERT CAMPBELL, OF STRASBURG JUNCTION, VIRGINIA.

## LIMEKILN.

No. 858,951.

Specification of Letters Patent.

Patented July 2, 1907.

Application filed February 5, 1907. Serial No. 355,811.

*To all whom it may concern:*

Be it known that I, JAMES HUBERT CAMPBELL, a citizen of the United States, residing at Strasburg Junction, in the county of Shenandoah and State of Virginia, have invented a new and useful Improvement in Limekilns, of which the following is a specification.

My invention relates to lime kilns of that class which employ a vertical stack or cupola into which at an elevated level at or near the top, the lime-stone is charged and into the lower portion of which stack one or more extraneous abutting furnaces discharge their heat and gases laterally into the stack to calcine the limestone, which, as it is reduced to quicklime, is removed from the drawing pit at the lower end of the stack. In lime kilns of this class the furnaces with their fire boxes, grates, and ash pit, are extraneous to and outside of the cupola or stack, but communicate with the interior of the latter through an arched opening at the back of each furnace and when the coal is burned upon the grates of these furnaces there is a large volume of hydrocarbon gases and carbon monoxid which escape into the stack unburned, which not only involves a large loss in fuel but, when bituminous coal is used, as is generally the case, the hydrocarbon gases condense into tarry like impurities on the lime which darken its color and impair its quality.

My invention is designed to overcome these difficulties and to this end it consists in the novel construction and arrangement of parts hereinafter shown and described.

Figure 1 is a vertical section through a lime kiln stack and one of its furnaces constructed in accordance with my invention. Fig. 2 is an inside face view of one of the arched openings leading from the furnace into the stack, and through which the heat and products of combustion are delivered into the stack. Fig. 3 is a horizontal section taken through one of the furnaces and Fig. 4 is a similar horizontal section showing a modification of the means for carrying out my invention.

In the drawings, Fig. 1, X is the lime kiln stack, and F is one of any number of furnaces which are built outside of the stack and each of which discharges into the stack at its largest interior diameter through an arched opening B. These furnaces have grate bars D located on a level with the top of the bridge wall C. They also have the usual ash pit, fire door and ash door as shown in Fig. 1.

A are horizontal coils of iron pipe set back into the masonry of the stack so that they afford no obstruction to the downward movement of the lime, which passes through the coils into the tapering cooling chamber below and thence into the drawing pit, from which it is removed. The coil of pipes A communicates with an externally placed blower or fan Z which is driven by an engine Y.

Communicating with the coil of air pipes A are arched pipes A', see Fig. 2, one or more for each furnace and which extend around the margin of the discharge throat from each furnace into the stack. This discharge throat is the full cross section of the furnace, i. e. it extends from the grate bars to the top of the furnace. These arched pipes are perforated throughout their length with issue orifices directed inwardly in relation to the throat of the furnace, so as to cause a large number of jets of hot air to impinge upon and mix with the volume of unconsumed gases issuing from the furnace into the stack. This hot air blast consumes these gases before they have time to condense on the limestone and thus furnish by combustion a high degree of heat to complete calcination, and at the same time prevent the staining of the lime with the condensed tar and lamp-black. These perforated pipes A' are set about six inches outside of the interior face of the stack, so that they afford no obstruction to the downward movement of lime and their issue orifices are not obstructed thereby. The secondary combustion of the gases by the hot air issuing at the point where they enter the stack causes a very high degree of heat which produces at this point a troublesome accumulation of clinker and for this reason the grate bars are placed on a level with the top of the bridge wall so that access may be had to the clinker, from the fire door, to dislodge and remove it.

The air heating coils A are placed a little below the bridge walls C of the furnaces, where they are not exposed to excessive heat, and they are preferably housed within an annular recess in the stack to be out of the way of the descending lime.

I do not confine my invention to the coils A located in the stack, as the air may be heated by any other means which may prove economical or advantageous. It will be quite advantageous to use hollow grate bars or pipes along the sides of the furnaces for heating the air, as this will involve no reorganization or reconstruction of the stack and is easier to get at for repairs. In Fig. 4, I show such an arrangement, in which the grate bars are made hollow and receive air from the blower Z through pipes  $a'$   $a^2$  and after being heated by passage through the grate, this hot air is delivered to the arched and perforated issue pipe A' surrounding the furnace throats. When this form of air heater is used I prefer to make the hollow bars in two sections D' and D<sup>2</sup> each having a separate pipe  $a'$   $a^2$  from the blower and discharging into the issue pipe A' on opposite sides of the furnace by connection with the lower ends of the same.

In carrying out my invention, I do not limit myself to any means for heating the air, nor to any form of air forcing device, nor to any special material for making the passages through which the air to be heated is passed.

## I claim

1. A lime kiln comprising a stack, one or more external  
furnaces having a discharge opening at its inner end the  
full size of the maximum cross section of the fire chamber  
5 and having grate bars arranged on a level with the bot-  
tom of said opening and air passages with discharge out-  
lets extending around the said opening at a point between  
the furnace and stack and means for heating and forcing  
air through the same to produce a secondary combustion.
- 10 2. A lime kiln, comprising a stack, one or more external

furnaces each having a discharge opening into the stack,  
air passages surrounding said discharge openings, hollow  
grate bars communicating therewith and means for fore-  
ing air through the grate bars and air passages and de-  
livering it between the furnace outlet and lime kiln stack 15

JAMES HUBERT CAMPBELL.

## Witnesses:

A. C. STICKLEY,  
R. S. FUNK.