J. W. LE GORE.

KILN.

APPLICATION FILED JUNE 22, 1907.

898,902.

Patented Sept. 15, 1908.

2 SHEETS—SHEET 1.

Fig. 1.

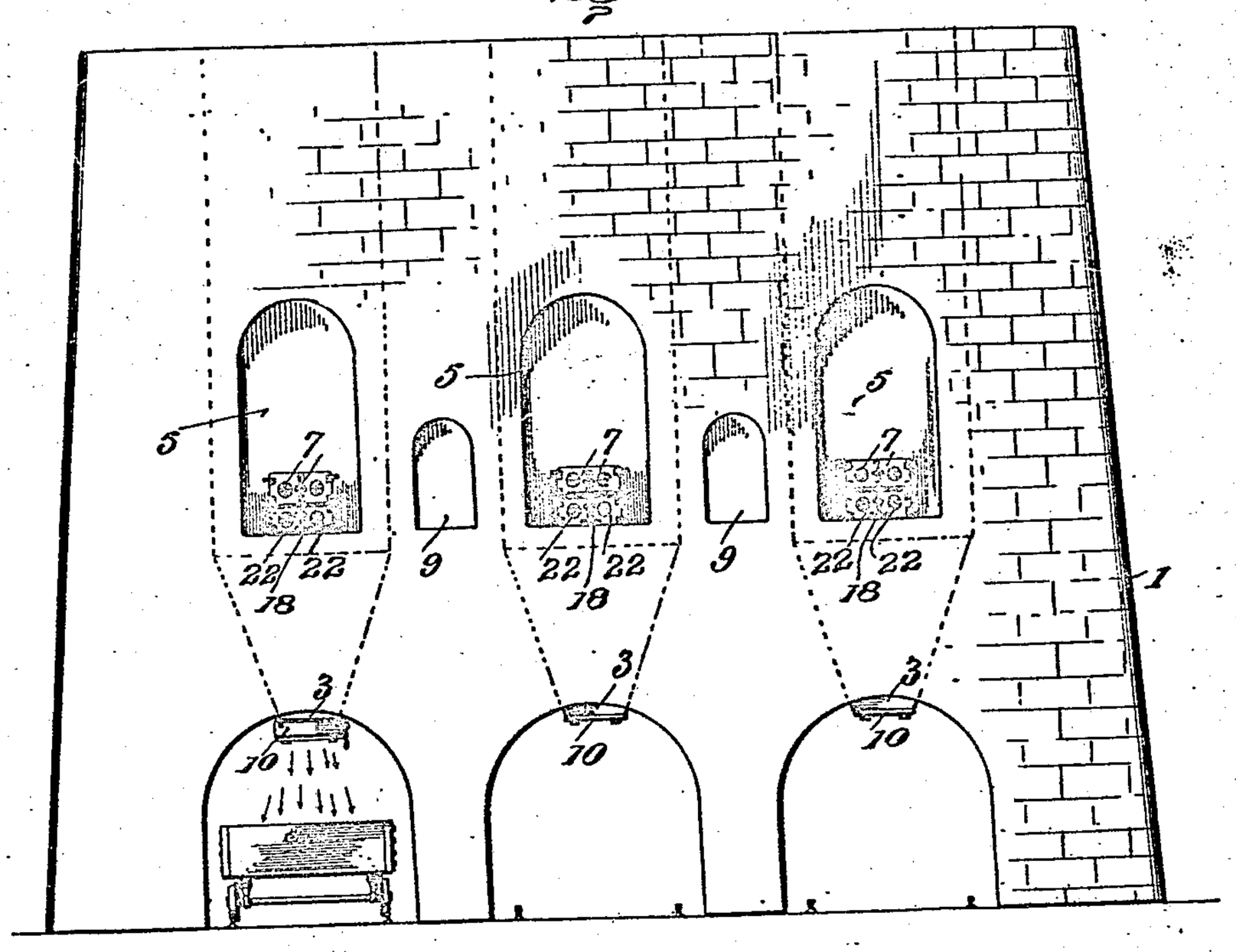
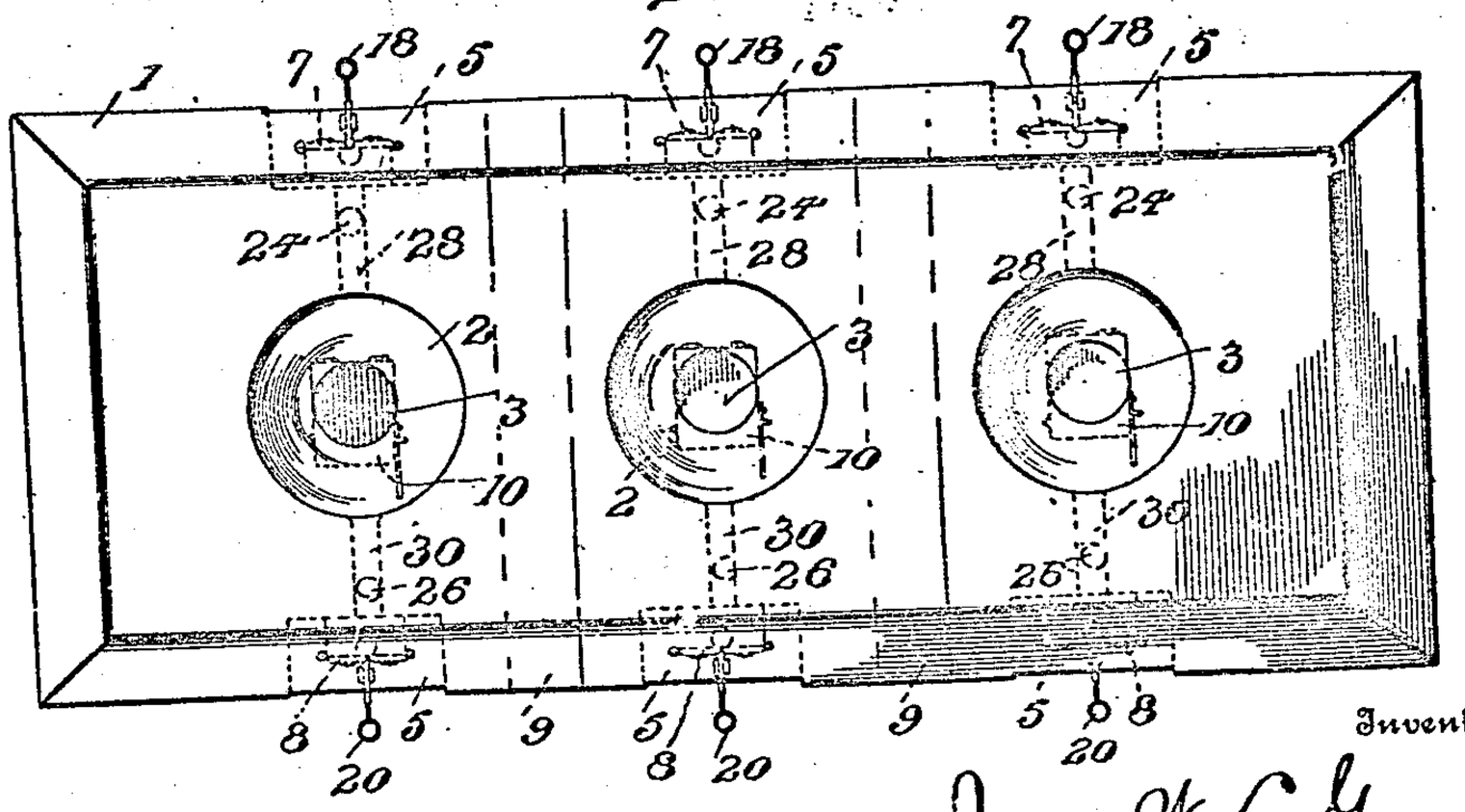



Fig. 2.

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Witnesses

W. A. Williams.

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2 SHEETS—SHEET 2.

Fig. 4.

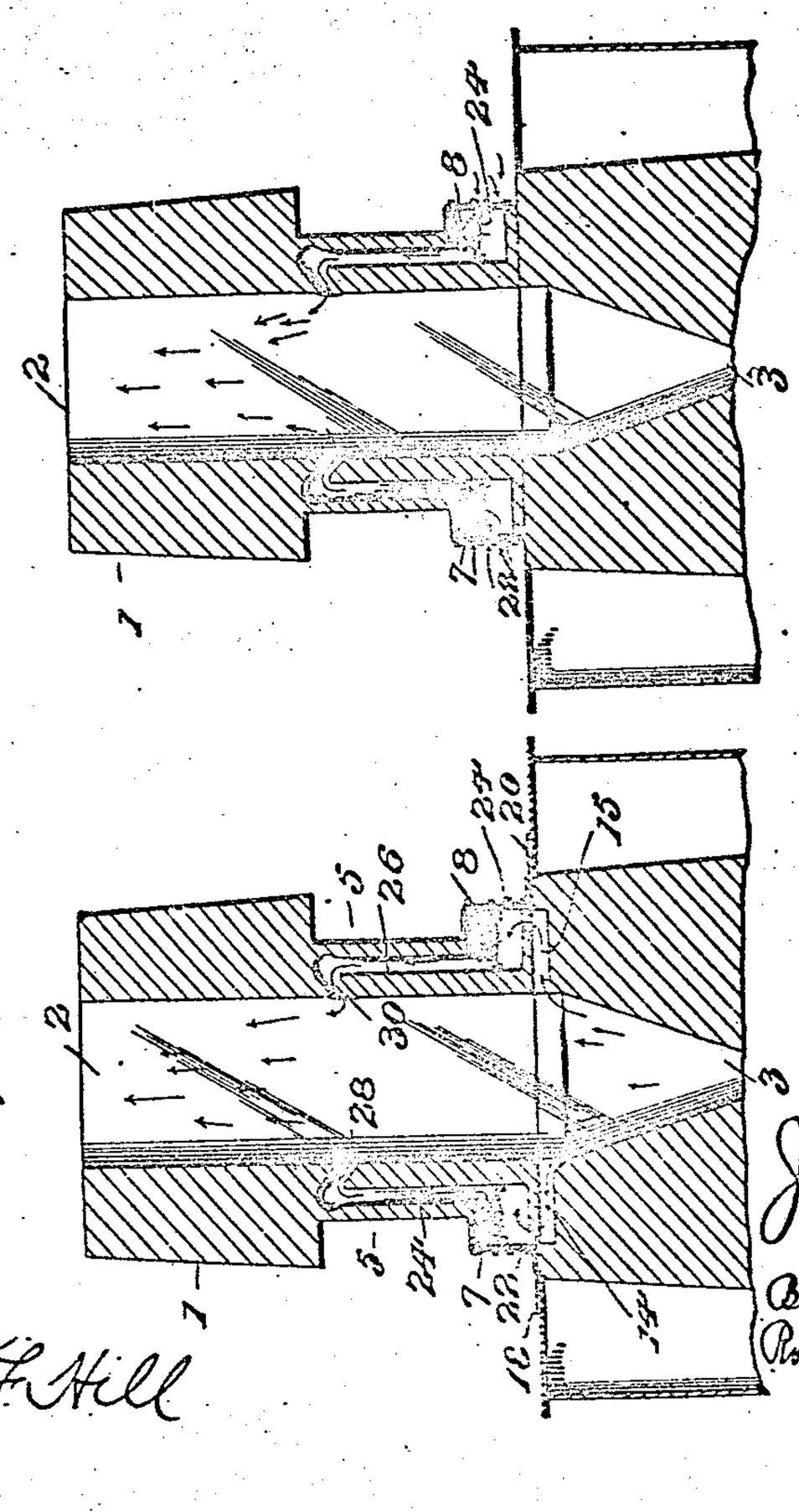


Fig. 3.




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# UNITED STATES PATENT OFFICE.

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## KILN.

No. 898,902. Specification of Letters Patent. Patented Sept. 15, 1908.

Application filed June 22, 1907. Serial No. 380,296.

*To all whom it may concern:*

Be it known that I, JAMES W. LE GORE, of Le Gore, in the county of Frederick and State of Maryland, have invented certain new and useful Improvements in Kilns, of which the following is a specification.

This invention relates to structures for calcining lime carbonates and especially to that form of structure known as "perpetual flame lime kilns" in which the material is calcined by the intense heat of the flame and hot gases produced by fires operated in separate chambers or furnaces so that no part of the fuel or ash is mixed with either the raw or finished product.

The objects of my invention are to provide a kiln that will affect a large saving in fuel; that will turn out free of core a superior and regularly burnt product; that will be unequaled for ease of maintenance and operation; of simple construction so that any of its parts may be easily and cheaply repaired and replaced without materially affecting the other parts; and which will be capable of large capacity.

To carry out the objects of my invention I utilize the waste heated air from the chamber in which the burnt lime is cooling to provide a means of draft for the furnaces, and thus avoid the necessity of preheating the air by means independent of the kiln. The heated air from the cooling mass may be fed to the furnaces in a large enough supply to give all the draft needed, or it may be augmented by an additional draft leading from the exterior into and through the fire box so as to prevent the grate from getting too hot.

The invention also comprises a combustion flue or chamber of suitable dimensions above the furnace which is sufficient to give a thorough combustion so that all the gases are consumed before the intensely heated air enters the burning or calcining chamber. This plan of compressing the gases serves to effect a great saving in fuel. This combustion chamber is a source of great economy even when the draft for the furnace is supplied by cold air, but a much greater saving is effected when the already heated air from the cooling lime is used. The draft may of course be supplied either from air which has been passed through the cooling lime, as above described, or when it is desired to secure more current than is practical to draw through the cooling lime, the air may be drawn from the outside; but the desired amount of each current of air can readily be regulated by the use of common dampers adjustable at will by the operator to suit the different conditions of the heat and the kiln.

With the aforesaid objects in view, my invention may be said to consist of the kiln which will be hereinafter more particularly described, in its preferable embodiment, illustrated in the accompanying drawings, and then set forth by the claims at the end hereof.

In the drawings accompanying and forming part of this application: Figure 1 is a front elevation of a kiln constructed in accordance with my invention but with parts broken away; Fig. 2 is a top plan. Fig. 3 is a section through one of the burning chambers showing the furnaces on opposite sides; Fig. 4 is a similar view of a modification.

Referring now to the details of the drawings by numerals: 1 represents the structure which may be made of any desirable material such as concrete, masonry, etc., and, as illustrated in Fig. 1, there are shown a battery of three kilns each of which is provided with a charging opening at the top and with a discharging opening at the bottom, these being designated 2 and 3 respectively. The discharge is arranged over a tunnel or passage-way through which cars or wagons may be run to carry off the lime.

As indicated in Fig. 3 each kiln has an arch-way 5 on opposite sides in which face the furnaces 7 and 8 and between each pair of kilns, as illustrated in Fig. 1, there is a passage-way 9 leading entirely through the kiln structure so that an attendant may easily reach the furnaces on either side for the purpose of feeding or regulating the same. The interior of the kiln may be of the ordinary structure and is preferably formed of inverted cone shape at the bottom so that as the material is burnt it settles at the bottom until a charge of thoroughly burnt lime is run off through any form of discharging device which is illustrated diagrammatically at 10.

As illustrated in Fig. 3 each of the furnaces is provided with a flue or chamber 14 and 15 leading from the inverted cone shaped bottom of the kiln into the ash-pit of the furnace, suitable dampers 18 and 20 being provided to regulate the draft. The ash-pits are also provided with the usual dampers 22 and 24

by which draft may be supplied from the exterior whenever desired.

As illustrated in Fig. 3 the hot gases from the furnaces 7 and 8 are not led directly into the kiln chamber but are led into combustion chambers 24 and 26 formed in the walls of the kiln and which finally lead into the burning chamber of the kiln at the points designated 28 and 30. By means of these combustion chambers 24 and 26 there is a thorough combustion before any hot gases are permitted to pass into the kiln.

Before proceeding with the description of the modified form of my invention, it may be best to briefly state that although more perfect results may be obtained by using the dampers 18 and 20 and obtaining the draft entirely or partially, as the occasion requires, from the air which passes through the cooling lime in the inverted cone shaped bottom of the kiln, and while I consider that the method of burning lime by obtaining the draft from the air which passes through the cooling lime as just described, is an essential part of my invention, yet a good measure of success may be obtained by the use of the kiln illustrated in the modified form of my invention shown in Fig. 4 in which the draft is supplied entirely from the exterior through the dampers in the ash-pits.

In the operation of my kiln, after the furnaces are started and the first charge of lime is drawn off, the succeeding charges settle into the inverted cone shaped bottom and are permitted to stay there, before being drawn off, until cooled. During the cooling, the heat which is naturally lost, is led from the cooling mass through the flues 14 and 15 into the ash-pits of the furnaces 7 and 8, the amount of draft being controlled by the dampers 18 and 20. The air fed to the furnaces is thus effectually heated and if the heat is too intense at the time when the mass is first cooling off a further supply of air may be drawn from the exterior so as to prevent any burning of the grates and the dampers may be regulated to produce the best results by using either preheated draft alone, or the exterior draft alone, or both together. And owing to the combustion chambers 24 and 26, the fuel is thoroughly consumed before it is passed into the burning chamber. It will be readily seen that by supplying hot air for the draft, the rapid generation of all the gases contained in the fuel is greatly increased so that thorough combustion is more readily produced in the combustion chamber before reaching the product to be heated in the calcining chamber. The combustion chambers have the further function of preventing any direct cold or unheated air from entering the kiln and deteriorating the product. By utilizing the hot air for the fires or furnaces and having all the gases passing from the furnaces through the combustion chamber, I obtain the full power and benefit of all the gases from the fuel consumed.

Another advantage due to the use of the combustion chamber located within the wall of the kiln is that by making this chamber of the proper length, I obtain the proper amount of space for the curing, soaking, and finishing calcining the lime thoroughly before it reaches the part of the kiln where it is cooled, and thus I prevent any core from passing through the kiln.

It is obvious that changes may be made in the form of my kiln and in the furnaces and combustion chambers and I do not limit myself to any special construction or any particular material but refer to the appended claims to point out the scope of my invention.

What I claim as new is:

1. The method of burning lime or other material which consists in leading all the gases from the furnaces through a combustion chamber in the walls of the kiln of sufficient dimension to insure practically complete combustion and to afford room within the burning chamber of the kiln for the proper curing and calcining of the lime.

2. The method of burning lime or other material which consists in leading the heated air from the cooling chamber through the furnaces, leading all the gases from the furnaces through a combustion chamber in the walls of the kiln of sufficient dimension to insure practically complete combustion and to afford room within the burning chamber of the kiln for the proper curing and calcining of the lime, whereby as the lime is cooled in the lower part of the kiln heated air is drawn therefrom and led into the furnace and then into the kiln at a height to afford combustion and form a space for the burning and calcining of the lime.

3. A kiln comprising a burning chamber, a cooling chamber at the bottom thereof, a discharge chamber under said cooling chamber, a furnace, and a flue or passageway leading directly from the cooling chamber to the furnace, whereby air is drawn directly through the cooling lime and used for the draft and dampers controlling the said flue or passage-way from the cooling chamber to the furnace, and said kiln also having a chamber above the cooling chamber of sufficient dimension to insure the proper curing and calcining of the lime.

4. A kiln comprising a burning chamber, a cooling chamber at the bottom thereof, a discharge chamber under said cooling chamber, a furnace, and a flue or passage-way leading directly from the cooling chamber to the furnace, whereby air is drawn directly through the cooling lime and used for the draft, and a combustion chamber in the wall of the kiln of sufficient dimension to insure practically complete combustion and to form a burning

chamber between the entrance of the combustion chamber into the kiln and the aforesaid cooling chamber and said combustion chamber conducting all the gases to the burning chamber.

5. In a kiln, a burning chamber, an exterior furnace, and a combustion chamber between said furnace and said burning chamber of sufficient dimension to insure practically complete combustion and forming a chamber below the entrance of the combustion chamber in the kiln to permit the burnt material to thoroughly calcine before being cooled.

Signed by me at Washington, D. C. this 19th day of June 1907.

JAMES W. LE GORE.

Witnesses:
HENDERSON F. HILL,
H. S. IMIRIE.