

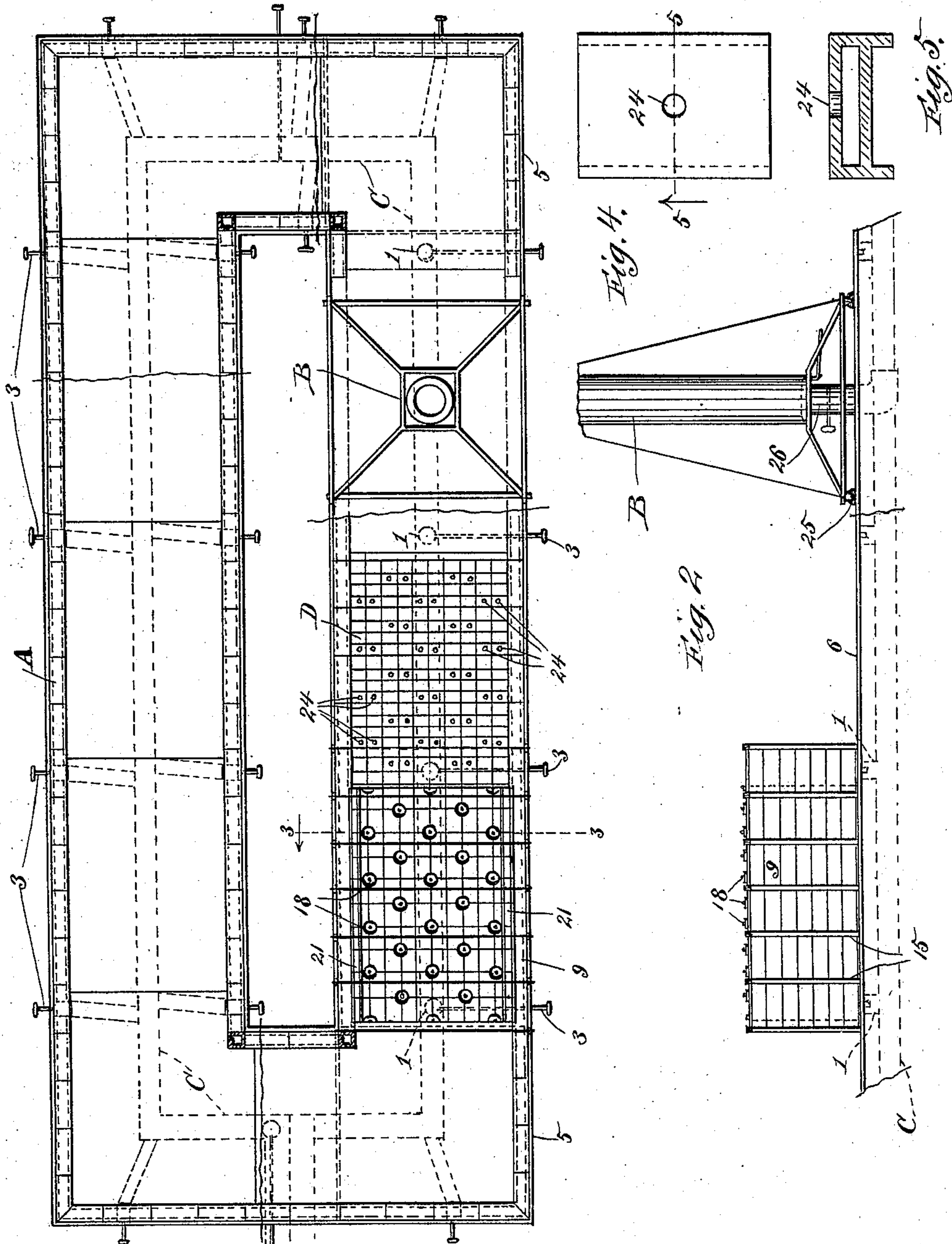
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3 Sheets—Sheet 1.

F. D. T. LEHMANN.  
CONTINUOUS KILN.

No. 577,046.

Patented Feb. 16, 1897.



Witnesses: *Fig. 1*  
*Rudolph W. Lutz*  
*John H. Hartung*

Inventor:  
*Friedrich D. T. Lehmann*  
By *Samuel B. Kennedy*  
*Attys*



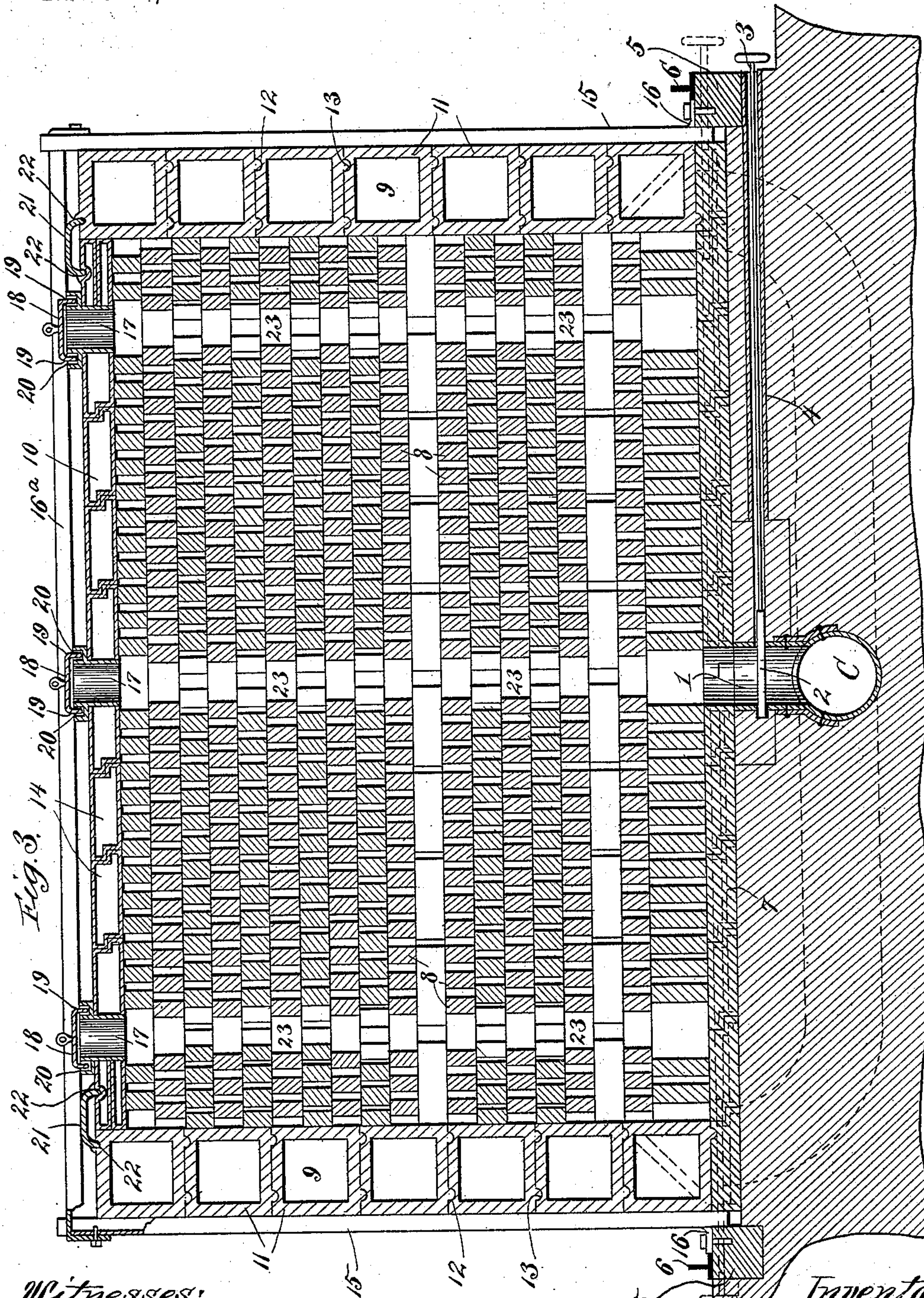
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Witnesses:

Rudolph V. Lutz  
Per. *[Signature]*

Inventor:  
Friedrich D. T. Lehmann  
By *[Signature]*  
Attys.



(No Model.)

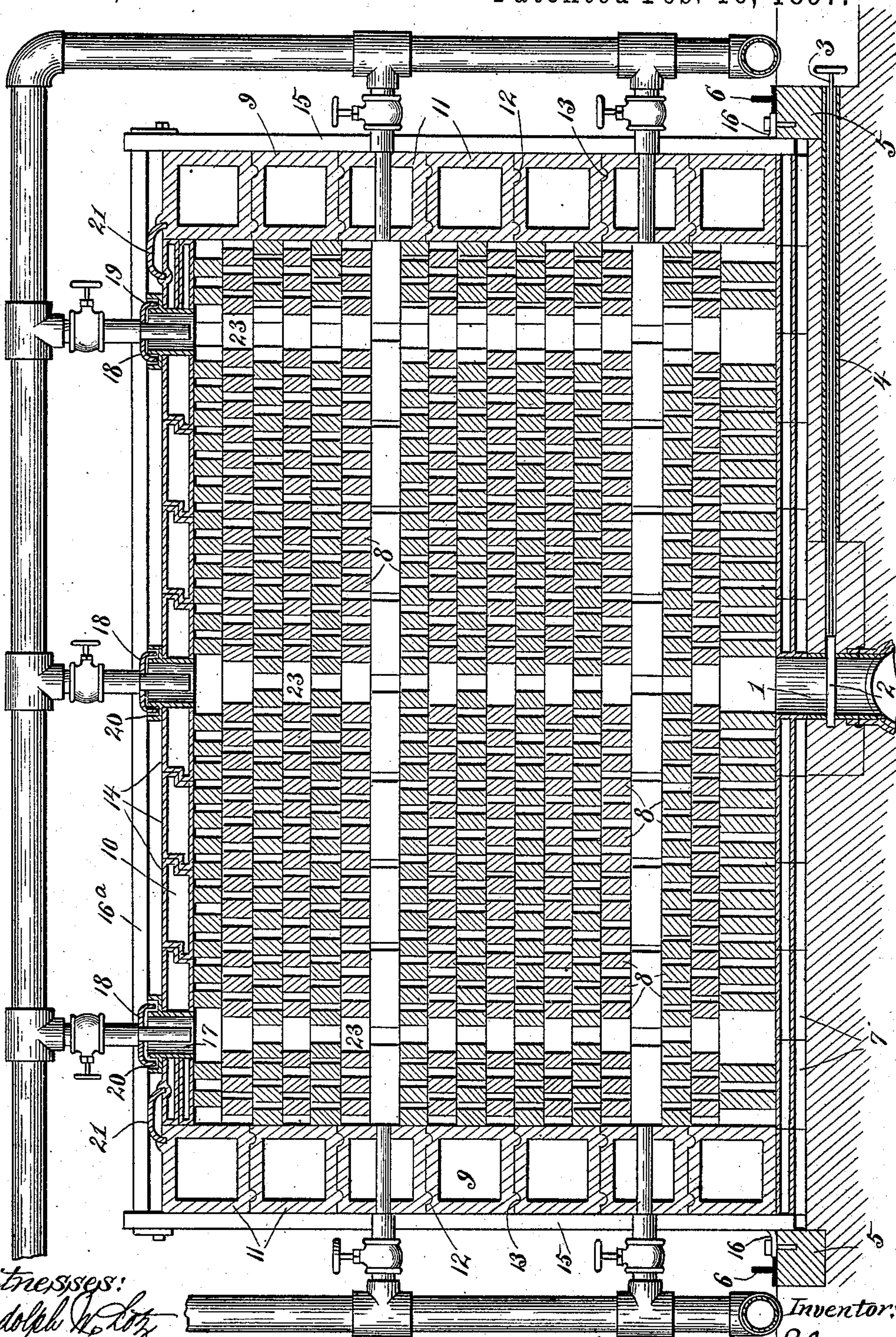
3 Sheets—Sheet 3.

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Fig. 6.



Witnesses:  
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Frank H. Hartung

Inventor:  
Friedrich D. T. Lehmann  
By Francis C. Kennedy  
Att'y.



# UNITED STATES PATENT OFFICE.

FRIEDRICH D. T. LEHMANN, OF CHICAGO, ILLINOIS, ASSIGNOR OF ONE-HALF  
TO PETER N. KOHLSAAT, OF SAME PLACE.

## CONTINUOUS KILN.

SPECIFICATION forming part of Letters Patent No. 577,046, dated February 16, 1897.

Application filed June 10, 1895. Serial No. 552,351. (No model.)

*To all whom it may concern:*

Be it known that I, FRIEDRICH D. T. LEHMANN, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Continuous Kilns; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to a novel construction in a continuous kiln for burning brick, tile, lime, cement, &c.; and it consists in the features of construction and combinations of parts hereinafter fully described and specifically claimed.

The object of my invention is to produce a kiln of the kind specified which will be of simple and inexpensive construction and efficient in operation.

In the accompanying drawings, illustrating my invention, Figure 1 is a plan view of a continuous kiln constructed in accordance with my invention. Fig. 2 is a side elevation of the same. Fig. 3 is a transverse sectional view taken on the line 3 3 of Figs. 1 and 2. Figs. 4 and 5 are detail views of a floor-tile I employ. Fig. 6 is a transverse sectional view of a kiln provided with apparatus for using oil or gas as fuel.

Heretofore, as far as I am informed, continuous kilns have been built with permanent walls and provided with doors through which the brick were carried in and out of the kiln, thus necessitating a large expenditure in building the kiln and also necessitating a large expenditure of labor and great hardship to the laborers on account of the heat. These objections my invention is designed to overcome. Besides it has other advantages over continuous kilns now in use; and to this end my invention consists, chiefly, in constructing a continuous kiln having portable walls, floor, flues, and covering, preferably of fire-proof tile, though any other suitable means for constructing walls having an insulating air-space therein can be employed.

In Fig. 1 the walls A are shown as built up completely around or with the brick or tile to be burned. The kiln is divided into sections in the usual manner and operated in the

same manner as the ordinary continuous kilns, the partitions being paper or any other suitable substance.

It is my intention that ten chambers shall constitute one continuous kiln, although any reasonable number may be employed, and that while nine chambers are in action the one fired first will be cool enough to be taken down and set up again with a fresh pile of brick, ready to be burned, thus forming a new chamber and keeping up a continuous fire. Meanwhile the finished brick are left uncovered, ready to be shipped.

In accordance with the principle involved by my invention I lay the flue C, leading to the chimney B, underground, preferably in the middle of the space designed to be included within the walls, and provide the same with openings 1 at intervals, the said openings being preferably spaced in accordance with the length of the kiln-sections, and are provided with dampers 2, operated by rods 3, passing out at the side of the kiln beyond the walls through a tube or pipe 4. At each side of the space to be covered by said kiln and beyond the outer faces of the walls I lay beams 5, sunk partially into the ground to give them a firm hold, which run parallel with said walls entirely around said kiln. Rails are laid upon said beams 5, upon which the chimney B runs.

In setting up said kiln the floor-tiles 7 are first laid and the bricks 8 then set up on said floor in a manner hereinafter specified. The walls 9 are then set up on both sides of or with said bricks 8, and the covering 10 is laid upon said bricks between the walls 9. The said walls 9 are preferably composed of hollow tiles 11, set one upon the other and end to end. Said hollow tiles 11 are provided on their upper and lower faces with grooves and tongues 12 and 13, respectively, the tongues on the lower faces of the upper tiles fitting into the grooves in the tiles below, said grooves to be filled with sand or any other suitable substance, thus making a tight joint. Obviously the joints between said tiles can be made in any suitable manner and said joints made tight in any desired manner. The said covering 10 is composed of hollow tiles 14, preferably constructed to lap over each other to make a



tight joint, made more effective by filling any spaces between said tiles, preferably, with sand. Channel-bars 15, provided with foot-pieces 16, adapted to rest upon said beams 5, are set up against the said walls 9 directly opposite each other and at regular intervals to cover the vertical joints between the tiles 11. The said channel-bars are held firmly against said walls 9 to brace the same by means of rods 16<sup>a</sup>, passing over the roof of the kiln and secured to the upper ends of said channel-bars, the channel-bars in connection with the foot-pieces and the tiles also forming pockets for sand-filling to close the vertical joints between the tiles air-tight. The said covering 10 is provided with openings 17 at regular intervals, through which fuel is fed to the kiln as the fire in same is advanced. The said openings 17 are provided with covers 18, having annular flanges 19, which fit in annular grooves 20, surrounding said openings 17. The said openings are effectively sealed by means of sand dropped into said grooves 20. To effectively seal any space which may occur between the said covering 10 and walls 9, I provide a cover consisting of a channel-bar or pipe-section 21, which lies in grooves 22 in said walls and covering, said grooves being filled with sand to make an effective seal. The said bricks 8 are piled so as to have vertical openings 23 in the piles directly underneath the said openings 17 in said covering 10, in order to provide firing-shafts.

It will be seen that the covering 10 is free and disconnected from the side walls of the kiln and that it rests upon the bricks or the material being burned in the kiln and that, furthermore, the connecting-piece or channel-bar 21 forms a yielding joint between the side walls and covering. Thus when the level of the bricks or material being burned descends the covering descends with it and the channel-bars maintain a close joint.

In order to obtain a more perfect combustion, I make the floor-tiles, as shown in Figs. 4 and 5, with two side walls projecting downwardly below the bottom wall thereof and make an opening 24 in the top thereof. The said tiles are laid side by side the entire length of the kiln and end to end crosswise of same, so as to form channels running from side to side of said kiln. As shown at D in Fig. 1, not all of said tiles are provided with said openings 24, but only those which are situated adjacent to and behind said vertical openings or firing-shafts 23 in said piles of bricks. Thus when fuel is dropped through said openings 17 to aid combustion air is let in at the ends of the channels directly behind said firing-shafts, and thus sufficient quantity of air is admitted thereto to make complete combustion. The said ends of said channels are adapted to be closed by any suitable means, such as an iron plate or tile set against the same.

The lower space in tiles for floor, Figs. 4 and 5, is designed to supply an exit for the

dampness which will arise from the ground through the action of the heat, and which is very injurious, as it will prevent the fire from burningsatisfactorily in the lower part of the chambers. The loss of brick spoiled from this cause is sometimes very great.

The said chimney B is mounted upon casters 25, adapted to run upon said tracks 6 on said beams 5. The said chimney B is constructed of sheet metal and is provided with a wide base, at each corner of which said casters are situated. At the lower end of said chimney B a pipe 26 is movably secured. Said pipe 26 is adapted to be raised and lowered to fit said openings in the main flue and is provided with a damper.

It is my intention that the system described above with a movable chimney shall be movable in all its parts, the flues to be made of drain-tiles or sewer-pipe, which can be taken up as the chambers are moved and used again as the situation requires. This kiln can be continued in a straight line or any other way desired, as, for instance, alongside a railroad-track or a wagon-road. If, however, the chimney is made stationary, as shown in Fig. 1, the sill, floor, and flues can also be made stationary of brick masonry. Then the kiln must follow the prescribed line. This way two fires can be burned one behind each other, and this system can be extended to a great capacity, as several kilns can be operated by one chimney or exhaust-fan. This system is also adapted for gas and oil, as the pipes can be laid and connected with the different chambers.

In Fig. 2 I have shown only one section and the chimney in elevation.

In Fig. 3 I have shown flues extending from the middle flue to each side of the kiln and provided with dampers. This construction would be preferable where a very wide kiln is desired.

In Fig. 6 I have shown pipes applied through which a gaseous fuel could be made to take the place of the coal or wood generally in use.

I do not, of course, wish to be limited to the exact construction shown and described, as I contemplate changing the form to suit any exigencies which may occur.

In continuous kilns of ordinary construction the heat taken up by the walls is lost, as it is well known that bricks are poor conductors of heat. By means of my construction, however, the heat taken up by the walls will by the circulation of the air within the same be conducted through the channels in same to the forward or new sections and serve to heat the same to a low degree of heat, the advantage of which will be obvious.

By means of my construction a great saving in labor is also effected, besides relieving the laborer from the hardship of working in a warm place, as the bricks are set up out in the open air and the walls then set up around or with the same, which is very easily done, and when the brick are burned the walls are



taken down, thus exposing the bricks on all sides and making handling of the same for purposes of transportation comparatively easy.

5 A kiln constructed in accordance with my invention can be set up immediately in condition to operate to full advantage without affecting the quality of the brick, as is the case with kilns now in use, which require several months in their construction and must be very slowly and carefully operated at first, as the dampness in the walls and ground is very injurious to proper burning. My kiln is also inexpensive as compared with those  
10 now in use, as it is only necessary to lay the flues and beams 5 and then set up the chimney or exhaust-fan, which is done in a very short time, as no mortar is used in its construction and the tiles are all made to fit in place. A kiln of this kind can also be transported from place to place at small cost, which is also very advantageous.

In continuous kilns the brick are piled up to the arches, and as they settle in the process of burning a vacuum is formed in the upper portion of the kiln, which causes an unsteady draft. This difficulty I overcome by constructing my covering so that the same will settle with the brick or tile, thus preventing the formation of such vacuum and insuring a steady draft.

The foregoing is the manner in which my kiln is constructed, and I will now describe the operation of the same—that is to say, as far as my experience teaches me at the present time.

For instance, as soon as the flues and chimney are completed the first section can be built up and started as soon as the paper partition is in place at the end of the same. A slow fire is started in front of the same, and the draft is led through the flue into the first chamber and is controlled by the aid of the damper, and the heat from this fire will dry the green bricks and prepare them for the burning. On the second day the second chamber is set up, and the paper partition back of it is put in place. The paper partition between the first and second chambers is now removed, and the draft is led through the flues in the first and second chambers. In this way a new chamber can be set and opened up every day. As soon as the first rows of bricks in the first chamber have taken fire  
40 fuel is added through the fire-holes 17 in the top, and the operator keeps the fire advancing as the situation may require by adding fuel and by the aid of the dampers. The heat from the first chamber will dry the bricks and prepare them for the fire, and the operator will control the draft in the different chambers by the aid of the dampers, graduating it as the situation requires. For instance, if the damper in the flue in the chamber which is at the  
50 greatest distance from the fire is wide open the one next to it is only partly open, while the damper in the flue in the first chamber is

closed entirely. On the fifth day after the fire is started in front of the first chamber the draft will have advanced to the flue in the fifth chamber. The bricks in the first chamber will have reached high-fire, that is to say, they are burned sufficiently, firing from the top ceases, and the bricks are left to cool. On the ninth day after the fire is started the draft will have advanced to the flue in the ninth chamber, the fifth chamber will have reached high-fire, and the first, second, third, and fourth chambers are cooling, while the sixth, seventh, eighth, and ninth are being prepared for the fire. On the tenth day the walls of the first chamber are cool enough to be taken down and set up with another pile of brick in front of the ninth chamber, forming a new chamber. The bricks in the first chamber are left uncovered, ready for shipment. The next day the second chamber will be taken down, and in this manner a continuous fire is kept up, and one chamber will be ready for shipment each day. Fire is only started once and can be kept up as long as desirable.

It will be understood that the above description is only given as an illustration of the manner in which the kiln can be operated and that as the operation and working of the kiln can vary as found convenient to adapt it to the particular circumstances present in each case.

I claim as my invention—

1. In a kiln, having a floor and removable walls and chimney or stack, a flue situated beneath said floor, openings in said floor with which said flue communicates, and dampers controlling said openings, substantially as described.

2. In a kiln, the side walls and covering, and a yielding joint between said side walls and covering consisting of a connecting-piece or channel-bar with its edges resting on said parts, substantially as described.

3. In a kiln, the side walls and covering having grooves near their edges, and a channel-bar or connecting-piece, having its edges resting in said grooves, substantially as described.

4. In a continuous kiln, a floor, a flue below said floor, a plurality of openings in said floor communicating with said flue, removable walls and covering for said kiln, a stack or chimney, and means for establishing communication between said flue and stack or chimney, substantially as described.

5. In a continuous kiln, a floor, a flue below said floor, a plurality of openings in said floor communicating with said flue, removable walls and covering for said kiln, a movable stack or chimney, and means for establishing communication between said flue and stack or chimney, substantially as described.

6. A kiln having a floor of hollow tile provided with openings at intervals to create a more perfect draft within said kiln, walls of hollow tile set up upon each side of said floor,



and a covering of hollow tile adapted to be laid upon the brick or tile to be burned and between said walls and provided with openings at intervals through which fuel is fed to the kiln, substantially as described.

5 7. A kiln having a floor of hollow tile provided with openings at intervals to create a more perfect draft within said kiln, and transverse flues adjacent the ground to form  
10 an exit for dampness arising therefrom, walls of hollow tile set up upon each side of said

floor, and a covering of hollow tile adapted to be laid upon the brick or tile to be burned and between said walls and provided with openings at intervals through which fuel is fed to the kiln, substantially as described. 15

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

FRIEDRICH D. T. LEHMANN.

Witnesses:

HARRY COBB KENNEDY,  
RUDOLPH W. LOTZ.