(No Model.)

2 Sheets—Sheet 1.

F. M. LANDE.

CEMENT KILN.

No. 551,390. Patented Dec. 17, 1895.

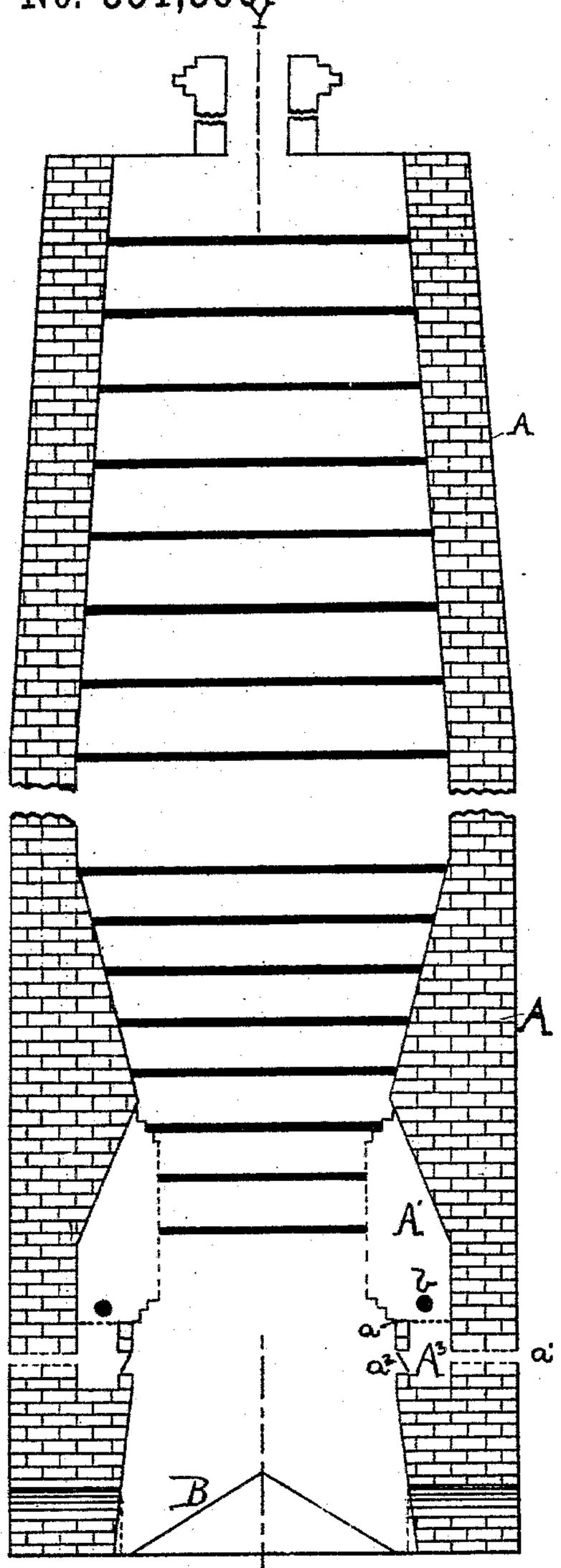

Fig. 1

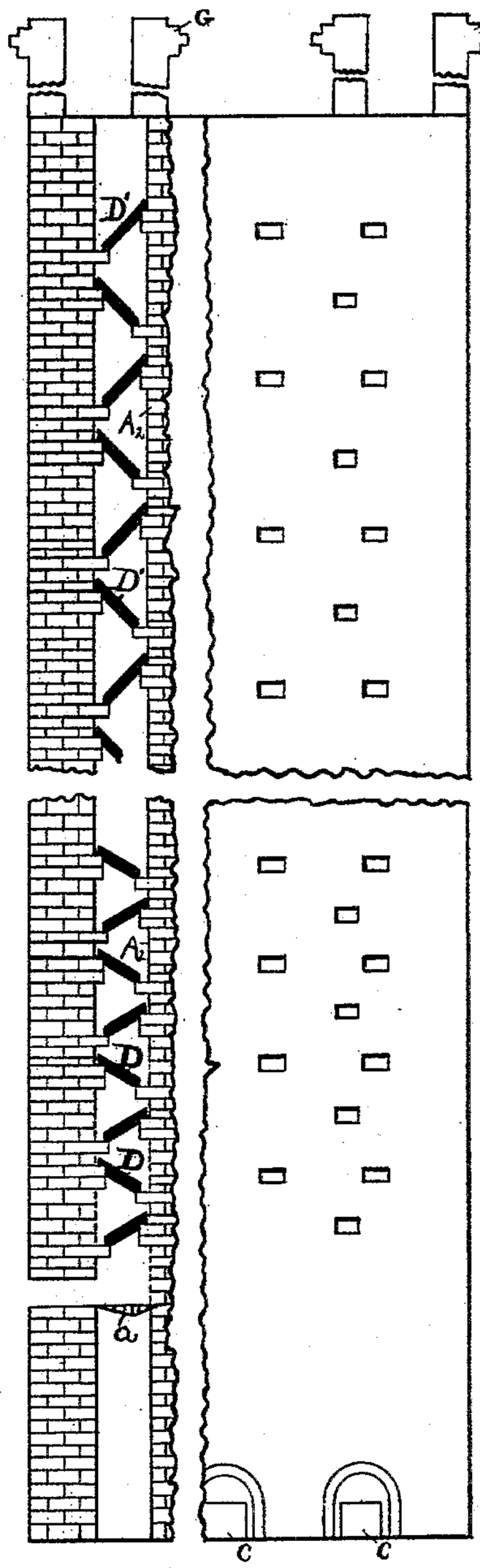

Fig. 2

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(No Model.) 2 Sheets—Sheet 2.

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Fig. 4.

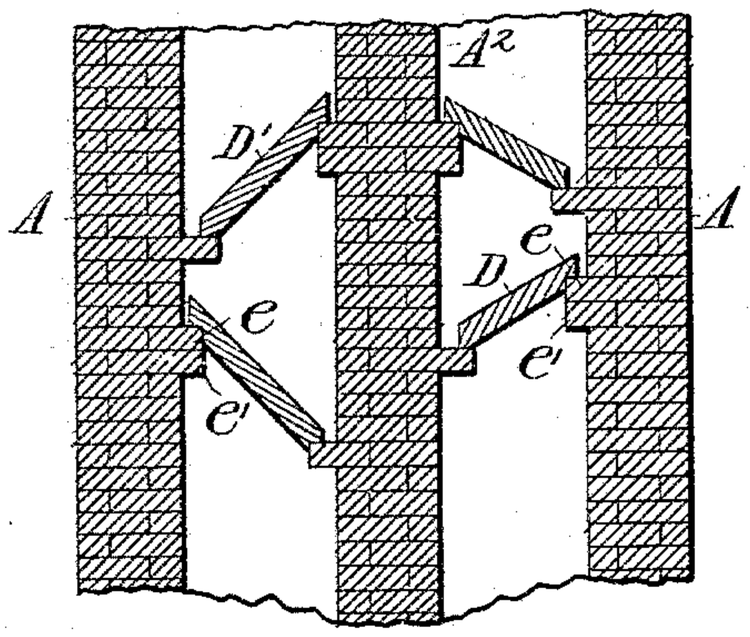


Fig. 7.

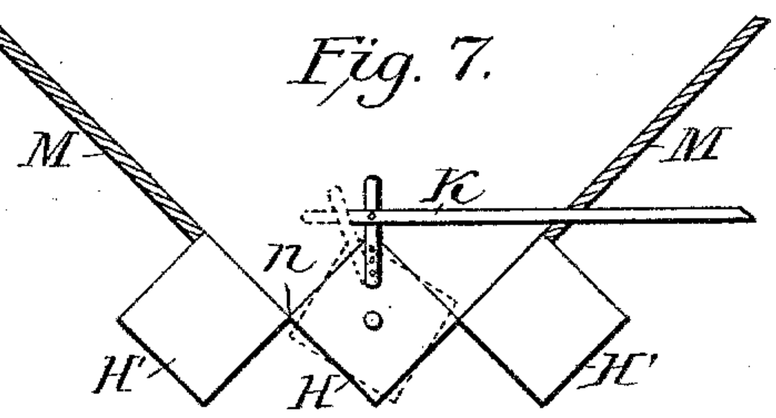


Fig. 5.

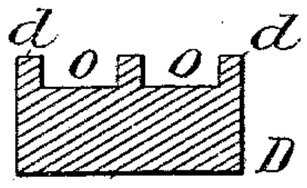
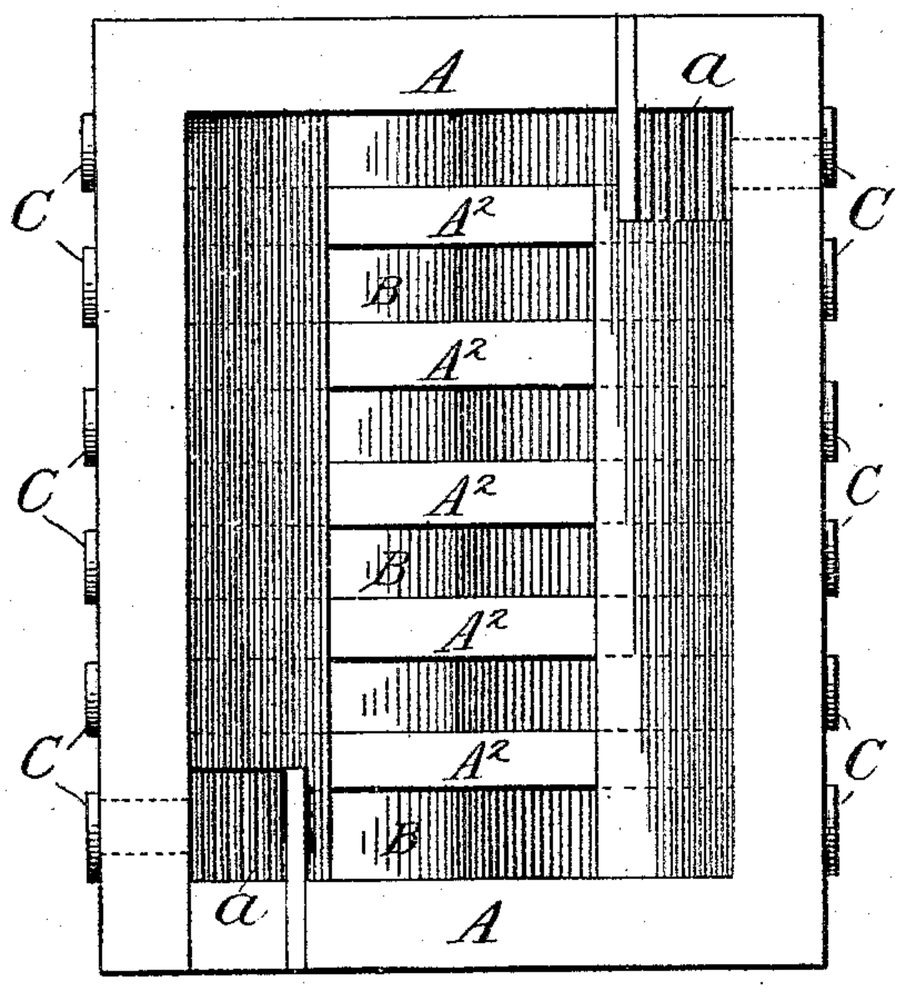


Fig. 6.

Fig. 3.



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UNITED STATES PATENT OFFICE.

FREDERIC M. LANDE, OF NEW YORK, N. Y.

CEMENT-KILN.

SPECIFICATION forming part of Letters Patent No. 551,390, dated December 17, 1895.

Application filed February 16, 1895. Serial No. 538,721. (No model.)

To all whom it may concern:

Be it known that I, FREDERIC M. LANDE, a citizen of the United States of America, residing at New York, county and State of New York, have invented certain new and useful Improvements in Cement-Kilns, of which the following is a specification.

My invention relates to kilns for the burning of Portland cement and the calcination of limestone and gypsum.

The two general methods of burning Portland cement are known as the "draw" and "rotary" kiln methods. In the first there is not only loss of heat but loss of material in the underburned and overburned clinkers, one required to be reburned, the other thrown away. Moreover, in the ordinary vertical kilns powdered material cannot be burned. In the rotary kilns there is great loss of heat, not only through the stack but by reason of the admission of an excess of cold air at the discharge end of the cylinder. Again, such kilns require frequent relining and other repairs and are expensive to construct and operate, as each requires a separate engine to rotate it.

In the kiln here presented I can pass the materials continuously and obviate the objections to the methods just described.

The accompanying drawings illustrate the construction of the device to attain the desired results.

In the drawings, Figure 1 is a vertical section of the kiln, showing the combustion-chamber and conical receiving-base; Fig. 2, a section on line Y Y, Fig. 1, showing the adjustable shelves and means of support therefor; Fig. 3, a plan view of the kiln; Fig. 4, a detail sectional view of the upper shelves and supports; Fig. 5, a detail plan view of one of the shelves; Fig. 6, a detail side view of same, and Fig. 7 an end section of the feeding apparatus.

The kiln may be built of any suitable height and width, depending on the quantity of material to be passed through in a given time. The outer shell A is preferably of hard-burned brick, the lining consisting of one or more courses of fire-clay brick. The kilns are divided vertically into a series of chambers by the divisional walls A^2, the interior being stepped off by the projecting ledge-bricks e e', the bricks e' being placed below the bricks e on opposite sides, as shown in Fig. 2. Inclined to the side walls and supported by these ledge-bricks are the deflecting shelves D D'. These shelves consist of fire-clay slabs cut away at one side so as to leave lugs d, Fig. 5, which rest on the supporting-ledges, the openings o forming a passage for the descent of the clinkers and the ascent of the gases. One under edge of the slab is made V-shaped to engage the edge of the supporting-brick, the opposite edge resting flat on the opposite lower brick. The shelves in the upper half of the kiln are inclined at an angle of about forty-five degrees, the lower shelves being inclined at an angle of about thirty degrees.

The raw material when it is first fed into the kiln is sharp and angular, and there is a tendency to adhere to the slash. Therefore, to insure a more rapid descent on the upper shelves, such shelves are given a greater angle of inclination. As the material approaches calcination and clinkers are formed, the surfaces of the clinkers become rounded, there is less friction and retardation on the shelves, and they begin to descend rapidly. Now, in order that the full effect of the heat may be obtained, the lower shelves (about one-half of the series) are given a decreased angle of inclination and thus increase the time of transit. This arrangement of shelves will meet the burning requirements for ordinary quick-setting Portland low in lime. If, however, a high-limed slow-setting Portland is wanted, the material requires a longer burning period in order to produce a perfect clinker. In this case, in order to retard the downward movement of the clinkers, the shelves are given a decreased angle of inclination. This is accomplished by removing the bricks e and dropping the upper ends of the shelves so as to rest on the bricks e'. This, it will be noted, gives an adjustability to the shelves and an adaptability of the kiln to high or low limed cements. The formed clinkers fall to a cone-shaped bottom B, where they are permitted to remain a sufficient time and yield up their heat to outside air and thus give an increased volume of hot gases to assist in the burning. After remaining at the bars a suitable time the clinkers

are drawn through doors C. The kiln is stepped at A′ to form a combustion-chamber for the gases given off by the petroleum or other gaseous fuel-burners *b*, arranged above the grates *a*. The air-chamber A^3 has an air-inlet *a′* and an air-outlet to the clinker-chamber by means of the damper a^2. At certain stages of the burning when the clinker-chamber has become partially filled the fuel may be reduced and air admitted to combine with the heated gases in this clinker-chamber, thus minimizing the consumption of fuel. This cannot be done in the rotary kiln, as a great volume of cold air is constantly being admitted at the discharge end of the cylinder. It will also be observed that the attrition on the shelves is a minimum, as there is not at any time a mass of material thereon.

In the rotary kilns the grinding action of the sliding mass of clinkers wears away the lining rapidly. This is obviated by the construction here shown, and, therefore, the cost of repairs is reduced to a minimum.

The required heat is generated by a suitable vapor burner or burners *b*.

It is of course necessary that the material be fed to the shelves in a uniform quantity. To attain this hoppers M are provided. These hoppers extend across the top of the series of chambers and are closed at the bottom by two rigid rectangular bars H′ and a central movable bar H, pivoted centrally and actuated by a lever K, having a fulcrum attached at the upper angle of bar H, Fig. 7, the opposite edges of the square being in contact with the inner edges *n* of bars H′. When bar H is moved by the lever K an opening at *n* is left between the edges, and the powdered material is permitted to fall through the shelves. The lever is given motion at definite intervals, so that the material may be fed uniformly. The feed may be increased or diminished by lengthening or shortening the lever-fulcrum.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A kiln for the purpose described having one or more chambers, each chamber having a series of removable, adjustable shelves, said shelves extending from side to side of the chamber and provided with supporting lugs and openings formed by the lugs, as and for the purpose set forth.

2. A kiln having a series of shelves inclined to each other, said shelves having lugs and openings at their lower edges as and for the purposes set forth.

3. A kiln the inner walls of which have supporting ledges for deflecting shelves, the upper side of the alternate ledges being removable to give said shelves an adjustable inclination as and for the purpose set forth.

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