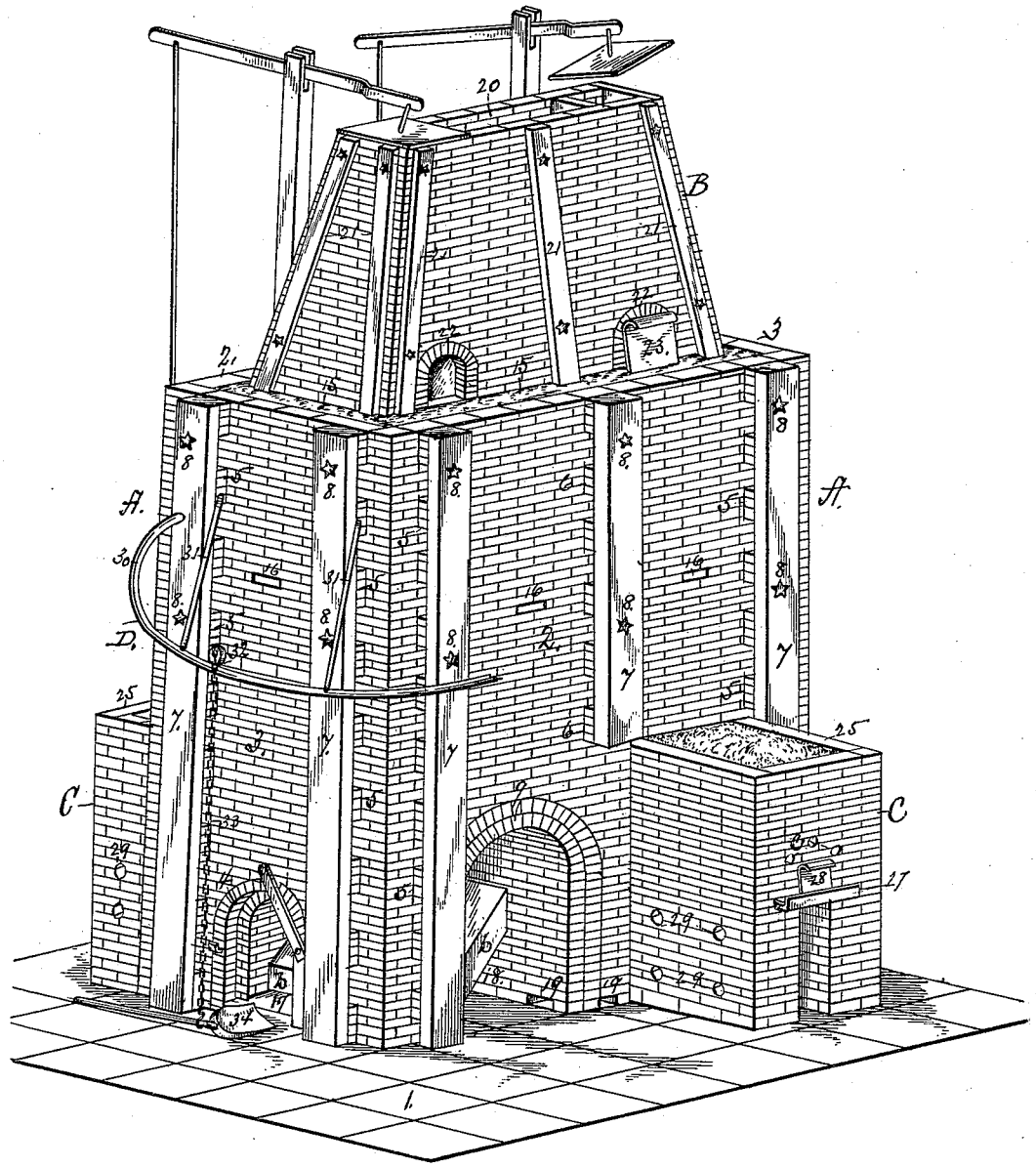
(No Model.) 2 Sheets—Sheet 1.

E. V. WINGARD.

LIMEKILN.

No. 346,835. Patented Aug. 3, 1886.

Fig. 1.



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(No Model.) 2 Sheets—Sheet 2.

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Fig. 2.

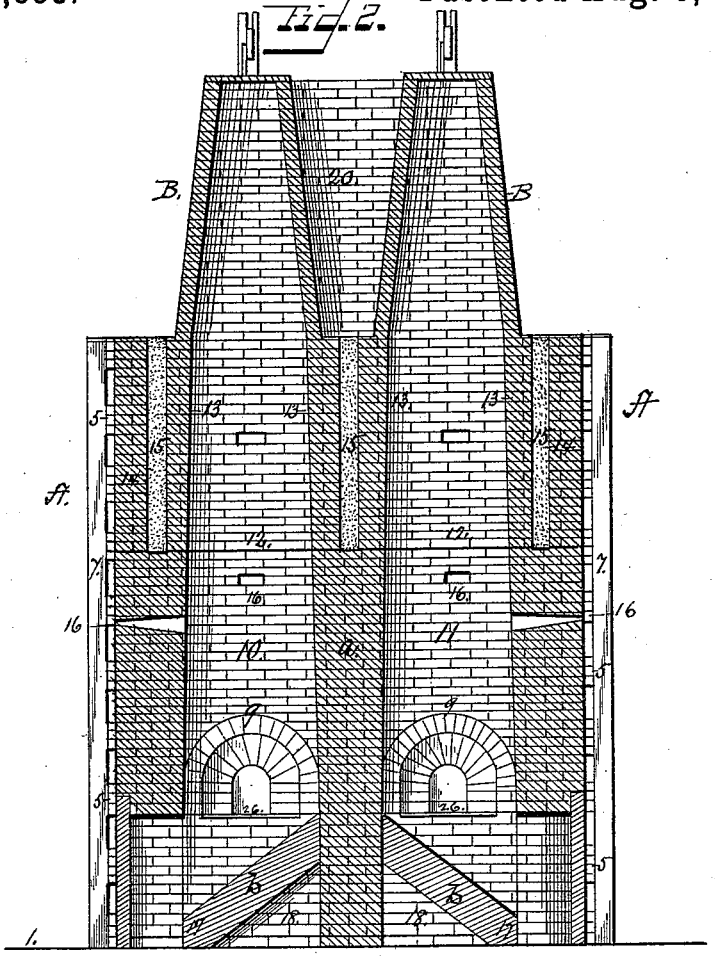
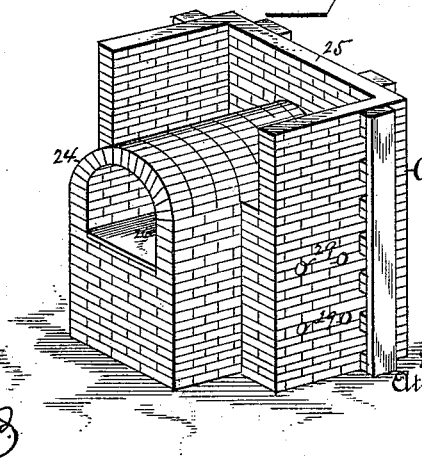


Fig. 3.



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UNITED STATES PATENT OFFICE.

EDWIN V. WINGARD, OF PHILADELPHIA, PENNSYLVANIA.

LIMEKILN.

SPECIFICATION forming part of Letters Patent No. 346,835, dated August 3, 1886.

Application filed May 26, 1886. Serial No. 203,273. (No model.)

To all whom it may concern:

Be it known that I, EDWIN V. WINGARD, a citizen of the United States of America, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented a new and useful Limekiln, of which the following is a specification.

My invention has relation to improvements in kilns for burning lime; and the objects are, first, to simplify and cheapen the construction of limekilns; second, to increase the durability of the limekiln; third, to make a kiln with furnaces which are disconnectedly fixed in position, or which may be taken down without disturbing the integrity of the main walls of the kiln; fourth, to increase the efficiency of the burning process and producing capacity of the kiln; and, fifth, to provide improved means for delivering the kiln of its products. These objects I attain by means of the improved construction shown in the drawings, and hereinafter described; and my invention therefore consists in the novel construction of parts, and their arrangenment or combination, as hereinafter will be more fully described, and especially as the same are pointed out in the claims made hereto.

I have fully shown my improved limekiln in the accompanying drawings, forming a part of this specification, wherein—

Figure 1 is a perspective view of the complete limekiln, one of the furnaces being removed to show the arch and inclined bottom of the kiln, the shovel and carrying-rod being also shown. Fig. 2 is a central vertical sectional view, and Fig. 3 is a perspective view, of one of the furnaces detached.

Reference being had to the drawings, the letter A designates the limekiln. The limekiln is set on an extended and substantial foundation, 1, made of bricks or stone. The walls of the limekiln are, as stated, set on this foundation, and consist of the side walls, 2, and end walls, 3. The exterior or main walls may be made of bricks or stone, those of the ends of the kiln having arched openings 4 formed in them at their base, as shown, which serve as the draw-holes through which the products of the kiln are taken out. At intervals, near the corners of the kiln, the bricks are set out from the face of the main walls, as seen at 5, and the same construction is made in the middle of the kiln, as seen at 6, and against these projecting bricks are set wooden binding-timbers 7, held in place by binding-rods 8, projected through the said timbers and the walls of the kiln. This construction and arrangement of the parts are intended to brace the walls against spreading, cracking, and the effects of whatever disturbance may emanate from expansion and contraction consequent on heating the kiln, and also to prevent the timbers from charring or burning by the heat of the walls, the spaces between the projecting bricks serving to let the air have free access back of the timbers, and thus preserve them entirely. The middle binding-timbers run down, preferably, to about the tops of the furnaces, as the tendency to crack or spread below this point in the middle is not as great as at the ends. Arches 9 are formed in each side of the kiln, to receive the projecting ends of the furnaces, which open into the cupolas of the kiln. The middle or partition wall, *a*, of the kiln extends from the base to the top of the kiln proper, and on a level with the sides and ends thereof. The cupolas 10 11 are built tapering from bottom to top, in order that the contents may be free to drop down and be less liable to clog during the process of burning. For a distance extending above the line of white heat, or above complete combustion, (indicated as at 12,) the cupolas are lined with fire-brick or other heat-enduring material, this lining being mortared against the outer material of the walls and forming therewith a solid structure from inside to the outer face. From the line 12 to the top of the kiln the lining is of common clay bricks, which are laid independently of the outer wall, forming a casing, as 13, with a space, 14, back of them, in which is disposed a mass of packing of sand or loam, 15. In the middle or partition wall, *a*, the same general construction and lining is presented, the upper portions being hollow and the packing disposed therein. This character of lining permits the lining to be taken down without impairing the outer walls, and at the same time with the packing behind it gives ample security to the parts. In the walls of the cupolas are formed "peep-holes" 16, through which the interior may be examined and the condition of the lime be ascertained. Pokers may be passed through

these holes and the contents stirred or disturbed and made to drop down as desired. An inclined bottom, *b*, is fixed in each cupola and arranged with the lower side of the bottom to form a step, 17, across the door or draw-hole, the purpose of the step being to permit the burned lime to more readily drop down on the floor of the foundation under the arch of the draw-hole, so that the shovel or scoop may be run under the discharged lime and taken away without materially disturbing the contents of the kiln, the lime which has fallen on the floor being separated by the fall over the step from that remaining in the kiln. In the kilns heretofore constructed these inclined bottoms are usually made a part of the foundation of the kiln and built solid therewith. This construction causes them to soon burn out, and their reparation is expensive and tedious. To overcome these difficulties and make the bottoms durable, I make the bottoms in the form of a plate with an air-chamber, 18, under them, and the bottoms may be made of a plate or stone laid on the proper angle and the brick bottom laid on the support. The step formed by the exposed edge of the inclined bottoms across the opening is of the height of the thickness of the bottoms, and in order that the current of air may be fresh and cooling I form air-passages 19 at the base of the walls opening into the chamber under the bottoms.

The letter B designates stacks. These are made of common clay bricks and extended to such height as may be necessary to give proper draft. The face or side walls are united, and an air-chamber, 20, formed between them to preserve them, while the connected side walls serve to hold the stacks firmly in position. These stacks are also braced by vertical timbers or bars 21, substantially as shown. At the base of each stack are formed the feed-holes 22, through which the limestone is supplied to the cupolas. Doors 23 are provided to close the feed-holes. To regulate the draft the stacks are provided with dampers, the plates of which set over the stacks, as seen in the drawings.

The letter C designates the furnaces. These are built of proper material and lined with fire-brick or other suitable material. It is the object of my improvements to make these furnaces disconnectedly set to or in the kiln to the extent that they may be taken down or out without destroying the arches or walls of the kiln, and to this end I build the furnaces with the arched projection 24, to set in the arches 9; but the meeting faces of the arches are not mortared or cemented together. The arches of the furnaces are extended for their length, as seen in Fig. 3 of the drawings, and the walls of the rectangular portion extending from the walls of the kiln are built up and around the sides of the arch, as shown at 25, and in the basin or chamber thus formed I deposit any non-combustible material—such as clay, loam, &c. This construction permits the furnace to be taken down when repairs are required, and the deposit of clay over the arched top of the furnace serves every purpose of more expensive construction.

The numerals 26 represent the grates; 27, flanged plates arranged across the bottoms of the feed-holes; 28, doors, which slide on the flanged plates and close the feed-holes of the furnace. It so happens that the direct draft through the opening of the ash-pit may from external causes become too strong, to remedy which I close the front of the ash-pit with a door, and admit the draft through side holes, 29, formed in the side walls of the furnaces below the grates, and like draft-holes, *c*, in the front wall above the grate and opening in the combustion-chamber.

The letter D designates the means for removing the lime from the cupolas and carrying it to the place of deposit. These means consist of the overhead carrying-bar 30, secured to the walls or timbers of the kiln, and supported by rods 31, extended and secured to the frame of the covering of the kiln, a carrying-sheave and hook, 32, chain 33, and shovel or scoop 34, having the chain secured to the handle. The shovel is swung to enter the draw-hole with its point to slide over the floor, and then forced under the deposit of lime, then lifted up by throwing weight on the handle, and then the shovel with its load can be drawn back, and by pushing the sheave will run on the carrying-bar, and thus to the place of deposit, when the load may be dumped or dropped. The carrying-bar may be extended from one end of the kiln to the other, so that one shovel will serve to take lime from both kilns or cupolas. Iron doors are fitted to the opening of the draw-holes, and when in position are held in place by a cross-bar resting in staples secured in the walls of the kiln.

It will be observed that the back end wall of the respective furnaces forms the wall of the kiln between the openings of the respective arches. It will also be observed that the kiln may be with equal utility and success used for calcining fire-clay or stone for cement purposes.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. A double limekiln having tapering cupolas separated by a wall of masonry, arched furnace-openings arranged on opposite sides of each cupola, at the base thereof, furnaces disconnectedly set within the arched furnace-opening of the kiln, with their back walls forming the walls of the cupola between the arched opening, inclined bottoms to the cupolas extending entirely across the same, having air-chambers under them and terminating in a step arranged across the draw-hole, and draw-holes in the ends of the kilns provided with floors arranged on a level with the bottoms of the steps of the inclined kiln-bottom, substantially as described.

2. A double limekiln having tapering cupolas separated by a wall of masonry, arched furnace-openings arranged on opposite sides of each cupola, at the base thereof, furnaces disconnectedly set within the arched furnace-openings, with their back walls forming the walls of the cupolas between the arched openings, stacks mounted on the cupolas and separated by a hollow partition-wall, and having feed-holes in the bases of the stacks, inclined bottoms to the cupolas extended across the same, and having air-chambers under them and terminating in a step arranged across the draw-hole, and draw-holes in the ends of the kiln, having floors on the level with the bottoms of the steps of the inclined kiln-bottom, substantially as described.

3. A double limekiln having tapering cupolas separated by a wall of masonry extended from the bottom to the top thereof, said cupolas being lined on all sides with fire-brick from their bases to a line above complete combustion, and from thence lined with common bricks to the top, said lining of common bricks being bound to the outer walls of the kiln, and set with a space between them and the main wall, a packing of incombustible and heat-non-conducting material arranged in said space, and tapering stacks of less exterior area than the top of the cupola, mounted on the top thereof, and having a hollow partition-wall between them, and provided with feed-holes at their bases, substantially as described.

4. The double limekiln herein described, consisting of tapering cupolas separated by a partition-wall, and having arched furnace-openings at their base on opposite sides of each cupola, and draw-holes in each end of the kiln, and inclined bottoms extending entirely across the bottom of the cupolas and terminating in a step arranged across the draw-holes, and having air-chambers beneath them, linings of fire-brick in said cupolas extended from the base to above complete combustion, and linings of common bricks above the fire-bricks to the top of the cupola, said lining of common bricks being set with a space between them and the main walls of the kiln, stacks mounted on the cupolas and separated by a hollow partition-wall, and furnaces disconnectedly set in the arched furnace-opening of the kiln, with their back walls to form the walls of the cupolas between the arched furnace-openings, substantially as described.

In testimony whereof I have hereunto set my hand in the presence of two attesting witnesses.

EDWIN V. WINGARD.

Attest:
A. G. HEYLMAN,
J. M. YZNAGA.