(No Model.)

J. ZELLWEGER.

LIMEKILN.

No. 265,478. Patented Oct. 3, 1882.

Fig. 1.

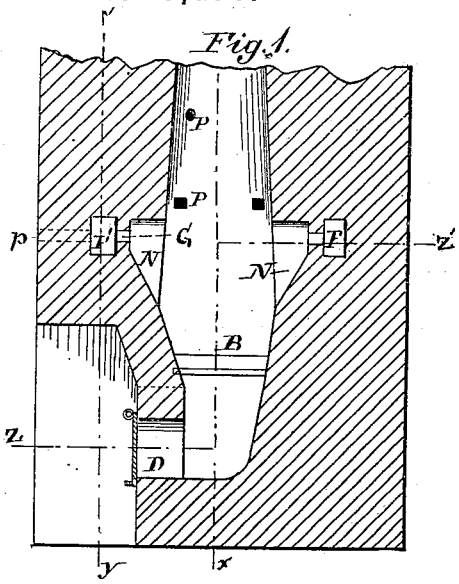


Fig. 2.

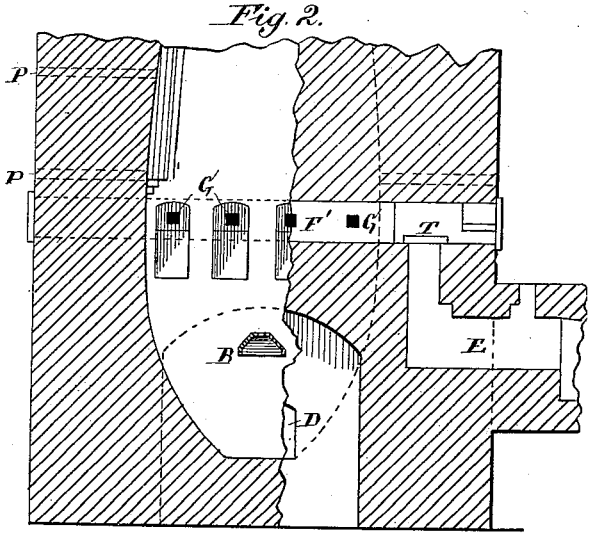


Fig. 3.

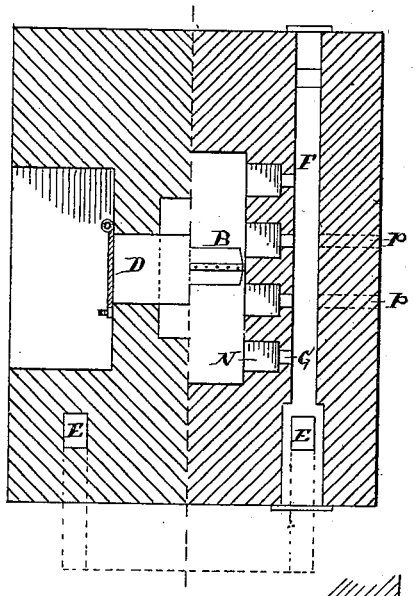


Fig. 4.

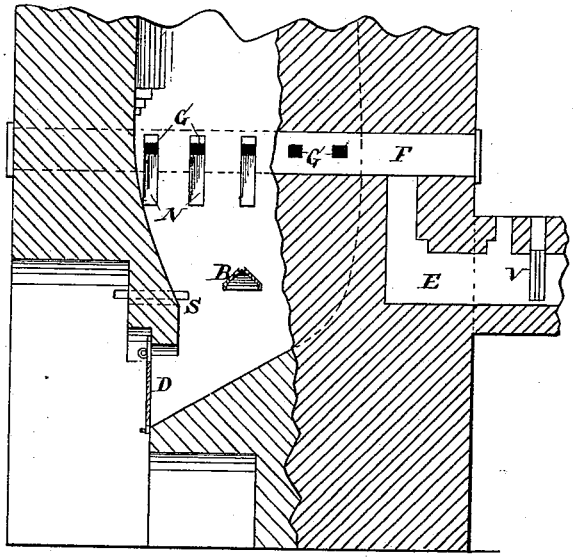


Fig. 5.

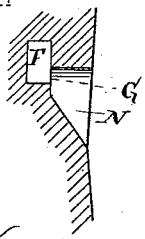
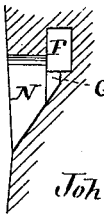


Fig. 6.



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UNITED STATES PATENT OFFICE.

JOHN ZELLWEGER, OF CHICAGO, ILLINOIS.

LIMEKILN.

SPECIFICATION forming part of Letters Patent No. 265,478, dated October 3, 1882.

Application filed April 10, 1882. (No model.)

To all whom it may concern:

Be it known that I, JOHN ZELLWEGER, 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 Limekilns; 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, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

My invention relates to that class of limekilns which use gas generated outside of the kiln, and more particularly to the class of direct-firing furnaces which work continuously with a steady and uninterrupted flow of gas from a number of gas-ports distributed along opposite sides of the kiln.

Heretofore the inlet-openings have been placed immediately under the roofs of the flues, or else have been passages opening out of the top of the same; but this makes the discharge of gas unequal. With this class of gas-kilns the gas reaches the several gas-ports through a horizontal distributing-flue, which flue must be constructed and placed so as to serve as a reservoir for the gas, and so as to be a uniform distributer of the gas to the several ports. The flue can only act in this double capacity when the outlets from it to the kiln-chamber are placed either in its floor, or, if in the side wall, some distance below the roof and all on a level. With such a location of the outlets from the flue, the fuel-gas, being specifically lighter than other gases that may be in the kiln or flue, will flow along the upper part of the flue and fill it to the top of the gas-ports before it escapes through them, and when it commences to discharge into the kiln it does so with approximate uniformity from all the ports. When the gas-ports are not located as above described, but in or near the roof of the flue, as has heretofore been the practice, the gas seeks the nearest outlet into the kiln through the first few holes it comes to, producing there a greater heat and stronger draft than in other parts of the kiln, which in turn permanently increases the discharge of gas through those ports. The unequal heat thus produced and kept up destroys the regular working of the kiln, causing it to yield "stone" in large quantities. The regular operation of a limekiln with direct gas-fire and updraft requires uniform heat in a given cross-section, which can only be obtained by an even distribution of the fuel-gas, and this I secure by locating the gas-ports as above indicated.

My invention further comprises an additional improvement to secure a uniform falling of the lime as it is drawn off from below.

In kilns as ordinarily constructed the lime works down faster in the center of the kiln than it does near the walls; but I remedy this defect by placing a bridge across the kiln near the bottom, above the draw-hole, and providing said bridge with openings for the passage of air, so that it will not interfere with the uniform working of the kiln. This bridge supports the lime in the center and distributes the flow more evenly over the cross-section of the kiln; and to check the flow from the region immediately over the draw-hole I sometimes use slide-bars which can be adjusted from the outside of the kiln.

Figure 1 is a vertical cross-section of a limekiln embodying my invention. Fig. 2 is a vertical longitudinal section, one half of the same being taken upon the line *x* and the other half upon the line *y* of Fig. 1. Fig. 3 is a horizontal cross-section upon the broken line *z z'* of Fig. 1. Fig. 4 is a vertical longitudinal section of a modified form of kiln from that illustrated by the preceding figures, the draw-hole being placed at one end of the chamber, while in the first figures the draw-hole is placed at one side. Figs. 5 and 6 are sections of a gas port and flue.

The gas enters the kiln through the flue E, which conveys it to the distributing-flues F F', which are provided with the gas-ports G, arranged along the sides of the kiln-chamber, through which the gas escapes into the niches N, where it meets the air that enters through the draw-hole D. The flame originated and developed in the niches N strikes and heats the lime in front and above said niches, and the products of combustion pass up through the rock, dry and heat the same, and escape at the top. The atmospheric air that enters through the draw-hole takes up the heat in the burnt

lime below the gas-ports, to be utilized in the process of burning the rock above, and the lime comes out of the kiln at the bottom cold.

The kiln-chamber is made tapering toward the top to allow for the expansion of the rock when heated and to permit the body of lime to settle more easily when drawn off below. In kilns the cross-section of which is long and narrow, whether rectangular or oblong, the lime often fails to fall uniformly, but works down faster at the center than along the walls and at the ends. To remedy this defect I introduce the shelf or bridge B, placed across the center of the kiln at right angles to the sides at a point some distance below the gas-ports. This bridge may be of stone, brick, or iron. It retards the flow of lime at the center and secures a uniform flow for the entire cross-section of the kiln. In the drawings this bridge is shown constructed of iron of a V-shaped cross-section, with the ridge uppermost, and provided with holes along the ridge for the passage of air, so that the bridge will not interfere with the uniform burning of the lime, and will also be kept cool.

If the draw-hole is at one end of the kiln, as shown in Fig. 4, I use, in addition to the bridge B, a series of slide-bars, S, which pass through the wall of the kiln above the draw-hole, and which can be driven into the kiln-chamber far enough to check the excessive flow of the lime, which naturally takes place directly over the draw-hole.

The best form of niche is that shown by Figs. 1, 2, 3, 5, and 6. They are wide recesses of suitable depth placed between narrow piers, the top of each niche being an arch supported on the piers. The back of the recess is a slope running back from the inside wall of the kiln, at the bottom of the recess, to the gas-port G, which is placed just under the roof of the recess. This construction facilitates the admission of air and the development of the flame before it strikes the lime, and the lime cannot fall into or clog the gas-ports. In Fig. 4 the niches have only the width of the gas-ports. A rectangular cross-section is the most practicable one for a kiln up to the level of the gas-ports. Above that point the corners should be rounded and drawn in and the sides made segments, so as to strengthen the walls and prevent the lime from binding in the corners.

The flues F should be straight to facilitate cleaning, and may either extend clear through the body of the kiln or only far enough to reach the gas-ports; and the gas-ports can open either from the side of a flue at a point below the roof or from the bottom, as shown in Fig. 6, but never from the roof or immediately under the roof.

Openings *p* may be provided through the outer walls of the kiln, at points opposite the gas-ports, for the purpose of cleaning them; also other openings, P, through to the kiln-chamber at points above the gas-ports, through which the process of burning can be observed and the lime can be poked down, if necessary. The supply of gas is regulated either by the slide-valve T in flue F, Fig. 2, or by the valve V in flue E, Fig. 4.

The two flues F F′ may have one common supply-flue, E, with only one valve, I or V; but they should be directly accessible from one end of the kiln.

It will be evident that my invention, though described in connection with a limekiln, is not necessarily restricted to a kiln used for burning lime, but is applicable to any kiln, stack, or roasting-furnace that receives gas generated outside of the kiln through openings in the side walls, and is adapted to receive the material to be burned or roasted, whatever it may be—whether lime or ore, for example—at the top of the kiln and discharge the same at the bottom; and I do not limit my invention in its application to limekilns alone, but it extends to all kilns of a like construction and operation.

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

1. In a limekiln, a distributing-flue having gas-ports opening from the bottom of the same, and all on a level, into the kiln-chamber, as and for the purpose set forth.

2. In a limekiln, a horizontal distributing flue or chamber having gas-ports in the side wall thereof adjoining the kiln-chamber, said ports being located at points some distance below the roof of the distributing-flue, and all opening on the same level and into the kiln-chamber, as and for the purpose set forth.

3. In a limekiln, the inverted-V-shaped bridge or shelf B, having openings in its ridge, and extending entirely across the kiln-chamber near the draw-pit thereof, as and for the purpose set forth.

4. In a limekiln, the combination of a gas-port with a recess in the wall of the kiln-chamber, said recess having a sloping back, as and for the purpose set forth.

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

JOHN ZELLWEGER.

Witnesses:
JOHN DRUECKER,
AUGUST JAEGER.