U. CUMMINGS.

PROCESS FOR THE MANUFACTURE OF LIME AND CEMENT.

No. 182,419. Patented Sept. 19, 1876.

Fig: 1.

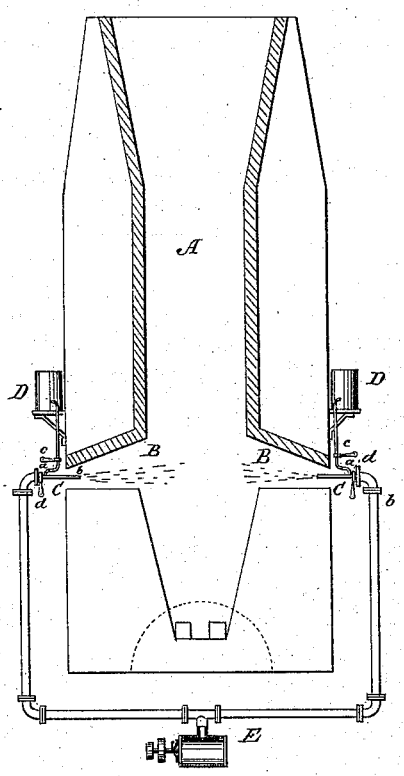


Fig: 2.

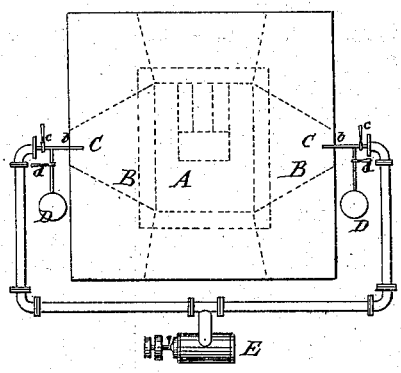
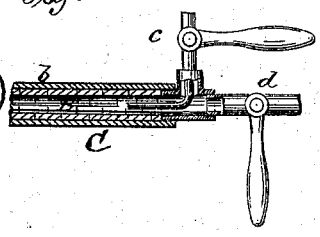


Fig: 3.



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URIAH CUMMINGS, OF BUFFALO, NEW YORK, ASSIGNOR TO HIMSELF, LEWIS J. BENNETT, AND WILLIAM W. PIERCE, OF SAME PLACE.

IMPROVEMENT IN PROCESSES FOR THE MANUFACTURE OF LIME AND CEMENT.

Specification forming part of Letters Patent No. **182,419**, dated September 19, 1876; application filed June 30, 1876.

To all whom it may concern:

Be it known that I, URIAH CUMMINGS, of Buffalo, in the county of Erie and State of New York, have invented a new and Improved Process for the Manufacture of Lime and Cement; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawing, forming part of this specification, in which the figure represents an apparatus designed for carrying out my invention.

The invention consists in a new process of burning lime or cement in a furnace by injecting a carbonized air-spray upon the stone after it has reached a red heat, and subsequently at a white heat, as hereinafter described.

A is an ordinary lime-kiln, having the furnace B, which is somewhat modified, to adapt them to my improvement. C C are nozzles consisting of an internal and external pipe, the internal one, *a*, being connected with a reservoir, D, containing petroleum or other liquid fuel, and the larger or external one, *b*, being of such size as to leave a liberal space around the internal pipe, which is lined with fire-brick B′, and is connected by a pipe with a blower, E, or other air-forcing apparatus. A suitable cock, *c*, is put in the pipe *a* to control the supply of liquid fuel. A cock, *d*, is placed in the pipe *b* to regulate the air-blast. The reservoir D is placed in an elevated position, so that the natural gravity of the liquid will carry it into the nozzle C; or it may be placed in such a position that it will require steam-pressure, or a pump, or other artificial means to force it through the nozzle C.

If fuel is used which is semi-fluid, and which will not flow at an ordinary temperature, the pipe which connects the reservoir D with the nozzle C should be placed in the walls of the kiln, so near the shaft or flue that it may receive sufficient heat to cause it to flow readily.

The manner of burning lime or cement under my improvement may be described as follows: The cupola A is filled with lime or cement stone. The reservoirs D are filled with petroleum or other liquid fuel; a fire is kindled in the furnaces B, near the nozzles C. The cocks *c* are adjusted to admit the required amount of fuel to the nozzles, and the cocks *d* are opened to admit the air-blast, which, in its passage through the nozzle, takes the liquid fuel as it comes from the pipe *a*, mingles with it, and drives it into the furnace in the form of spray. This carbonized air is thus injected in the form of spray upon the stone after it has reached a red heat, and afterward continued, completely filling the chamber of the furnace. The hot limestone reflects the heat back upon the slanting fire-brick walls, and the air, made combustible by the admixed carbon, produces the finest and cheapest flame yet known. Soon after the process is begun the brick lining of the furnace becomes incandescent, and the supply of fuel is augmented. A vast volume of flame is projected against and among the stones which fill the kiln, causing them to become quickly and perfectly calcined.

The process of filling the kiln and removing the calcined lime from the base of the cupola does not differ from the ordinary practice. Any hydrocarbon, such as crude petroleum, coal-tar, &c., may be used, the cheapest being preferred.

If too much heat is applied, the stone is vitrified and reduced to a worthless condition, and if too little heat is employed the product is no better than when it entered the kiln; and, besides this, the quality of the lime is deteriorated by the action of the sulphurous gas which emanates from the coal, and is injured by the admixture of ashes which are drawn into the cupola. When wood is used as fuel these difficulties exist to a certain extent.

The objections above alluded to are obviated by my improvement, as the heat is absolutely controllable, making it possible to produce and maintain a greater or less amount of heat at pleasure. This is very important; as without a well-regulated heat, which is proportioned to the materials in hand, the product will be inferior. The fuel which I employ is free from sulphur or creosote, both of which injure the quality of the lime or cement. By my process no smoke or ashes are produced.

In addition to the advantages already mentioned, one of the greatest is that a kiln working under my improvement has double the capacity of those working in the ordinary way, being the result of a uniform temperature and the peculiar action of the flame created by the

combustion of hydrocarbon, urged by a blast of air.

I am aware that liquid fuel has been employed for boilers and other purposes, and that a mixture of air and steam has been used in conjunction with the liquid; but they have failed hitherto to produce any satisfactory result, because the combustion has been imperfect.

I overcome this difficulty by injecting the fuel and air. An immediate heating of the liquid spray is thus obtained, the air being affected to the extent that perfect combustion at once takes place in the furnace. With steam, however, under a perfect combustion, I find that the heat is too intense, and exercises a deleterious influence upon cement and lime, as well as destroys rapidly the furnace-brick.

In other uses it is probable that this high heat may not be objectionable.

By using air alone, with the perfect combustion obtained, a good red heat is obtained, just sufficient in degree to make a very fine article of lime or cement, and that will only glaze the furnace-brick, causing them to be very durable.

Having thus described my invention, what I claim as new is—

In the process of manufacturing lime or cement, the injection of a carbonized air-spray directly upon the stone at a red heat, and subsequently, substantially as and for the purpose specified.

URIAH CUMMINGS.

Witnesses:
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