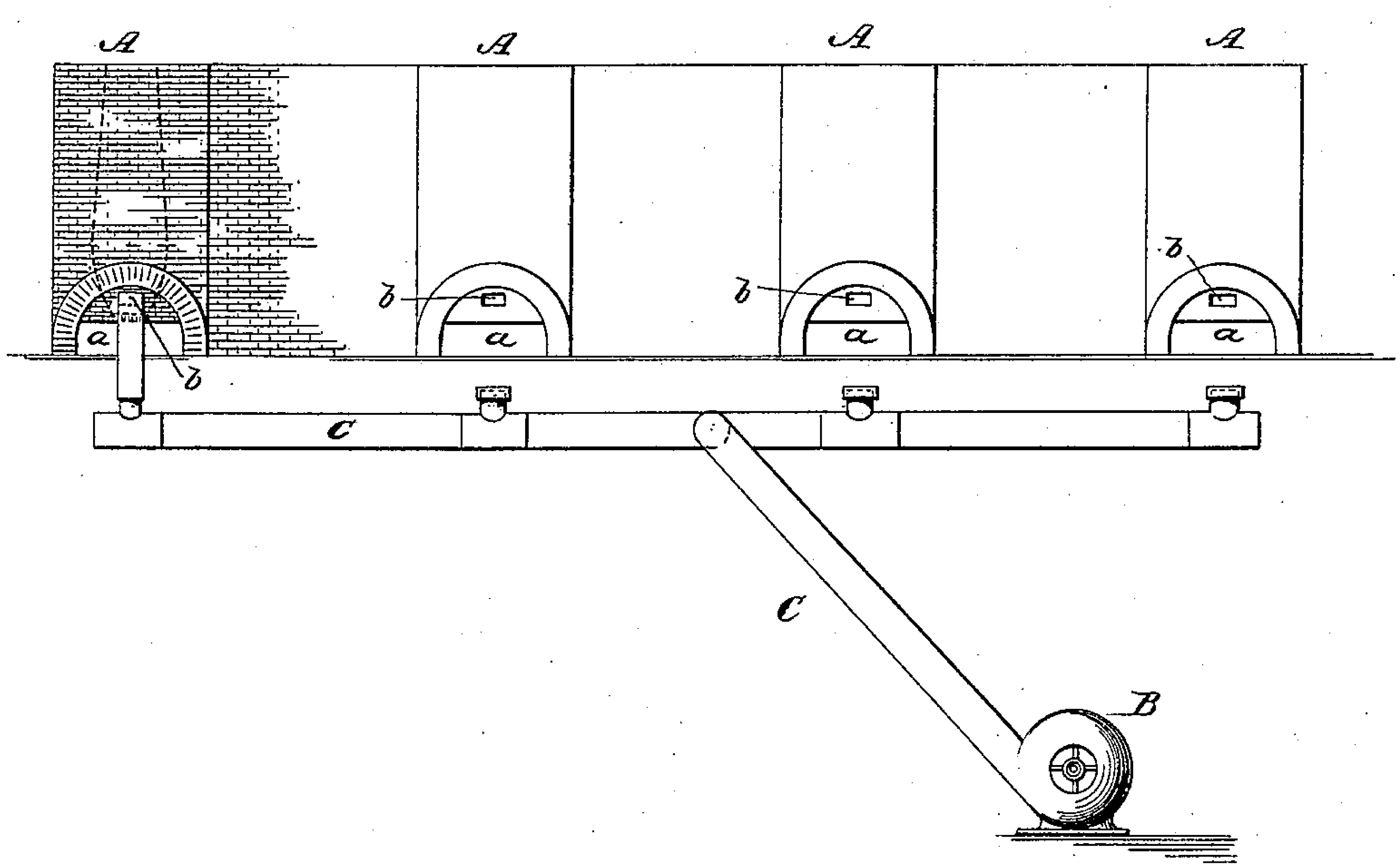
(No Model.)

R. W. LESLEY & D. GRIFFITH.

ART OF MANUFACTURING PORTLAND CEMENT.

No. 321,120. Patented June 30, 1885.



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UNITED STATES PATENT OFFICE.

ROBERT W. LESLEY AND DAVID GRIFFITH, OF EGYPT, PENNSYLVANIA, ASSIGNORS TO THE PENNSYLVANIA PATENT RIGHT COMPANY, OF SAME PLACE.

ART OF MANUFACTURING PORTLAND CEMENT.

SPECIFICATION forming part of Letters Patent No. 321,120, dated June 30, 1885.

Application filed November 22, 1884. (No model.)

To all whom it may concern:

Be it known that we, ROBERT W. LESLEY and DAVID GRIFFITH, both of Egypt, Lehigh county, State of Pennsylvania, have invented certain new and useful Improvements in the Art of Manufacturing Cement, of which the following is a specification.

Heretofore it has been usual to burn the cement-making material used in manufacturing Portland cement in what is known as a "set" kiln. The kiln is filled with alternate layers of combustible matter and cement-making material, fire is started, and the kiln is closed and remains so until it is burned out, and then the charge, after having been allowed to sufficiently cool, is drawn. This operation is necessarily tedious, some ten or twelve days elapsing between the charging and the drawing of the kiln. Furthermore, a great amount of heat goes to waste, because the kiln must cool down after each charge is burned, and requires to be reheated before the succeeding charge. Such also is the case when a hard-burned ordinary natural cement is sought to be produced. It manifestly would be of great advantage to burn the cement-making material in what is known as a "perpetual" kiln—that is to say, a kiln such as a limestone-kiln—in which the burned material is withdrawn each day from below, while fresh material is put on from above to replace that which is drawn. In such a kiln less time is consumed in the operation, while all the heat is economized and utilized. Notwithstanding, however, the recognized advantages of the perpetual kiln over the set kiln, it has been impracticable to use the former for calcining Portland and hard-burned cement-making material, because it is requisite to calcine this material to a clinker—that is to say, to the point of incipient vitrification. In this condition the mass agglutinates and forms in the kiln oftentimes a bridge, which not only upholds the charge above it, but impedes the draft to such an extent as to prevent the proper burning of that charge. The bridge frequently forms at points so high in the kiln—say fifteen or twenty feet or more above its base—that it is difficult to reach it, and the operation of breaking it under any circumstances is attended with great danger to the workmen. Moreover, it not unfrequently happens that only a part of the bridge is broken away, thus letting down a portion of the charge in a shape of a confused mass of mingled combustible and cement-making material, which is not in condition to burn properly. In fact, under such circumstances, it becomes necessary to empty the kiln and recharge it. It is our object to remove this obstacle to the use of perpetual kilns for calcining cement-making material to a clinker.

We have found that our object can be completely attained by directing a current of cold air (induced by a blower, such as used in connection with cupola-furnace or by other suitable means) against the under side of the clinker bridge. The effect of this is to cool the mass which forms the bridge. The parts against which the blast is directed cool more rapidly than those which are not exposed to the blast. The exposed parts in cooling contract and crack and separate from one another, thus gradually disintegrating and weakening the bridge, which finally succumbs to its weight and that of the superincumbent mass and falls, thus letting down the whole charge above without disturbing materially the relations of the combustible to the cement-making material.

The breaking down of the bridge might of course be accomplished by simply allowing the kiln to cool down without the use of extraneous agencies. This, however, would require days for its accomplishment, and would not allow of a perpetual kiln. By our method the breaking down of the bridge is effected in as many hours, at most, as it would take days in the natural way.

In the accompanying drawing we have represented diagrammatically a plant consisting of four perpetual kilns and apparatus for supplying either of them with a cold-air blast.

The interior of each kiln A is shaped not unlike a crucible. Its contracted lower end projects down through the arched chamber *a* beneath. The charge is drawn from the lower end of the kiln, and the latter has, as usual, a grate-surface above the opening. In the side of that part of the kiln which projects inside of the arched chamber is a poke-hole, *b*, through which the workman inserts the bar for stirring or poking the material in the kiln. The height of the kiln ordinarily is from thirty to thirty-five feet. It is nine feet wide at the top and contracted three feet at bottom, the contraction commencing at about eight or ten feet from the bottom. The kiln, in fact, is substantially the same as the ordinary perpetual kiln now in use for burning limestone.

B represents a blower, such as used, for instance, in connection with cupola iron-furnaces. From this blower lead underground pipes C to a position in convenient proximity to the kilns. At points opposite the kilns the pipes are provided with T-joints covered by air-tight caps. Whenever a bridge forms in any one of the kilns, the cap most convenient to be used is removed from the air-supply pipe. A pipe is coupled to the T-connection, and its other end is carried to and inserted in the poke-hole of the kiln. The blower is started, and a powerful blast of cold air is blown into the kiln up against the under face of the clinker bridge, with the effect of eventually cooling the bridge, and thus causing its contraction and fall. At the same time the blast passes up through the small holes and chinks which exist in the bridge, and thus supplies the needed air to support proper combustion in the charge above the bridge while the work of disintegrating the latter is progressing.

We prefer the employment of a forced blast entering the kiln below the bridge; but the same result can be attained in many instances, although perhaps not so efficiently, by the employment of a suction-fan or equivalent instrumentality above the bridge.

Having now described our improvement and the best way known to us of carrying it into effect, what we claim as new and of our own invention is—

The method of destroying the clinker bridge formed in a kiln by and during the operation of calcining cement-making material to a clinker, by directing against the under face of said bridge a current of cold air, so as to effect the cooling and consequent contraction and breaking down of the bridge, substantially as hereinbefore set forth.

In testimony whereof we have hereunto set our hands this 17th day of November, 1884.

R. W. LESLEY.
D. GRIFFITH.

Witnesses:
A. D. KACHLINE,
H. E. GUILLOU.