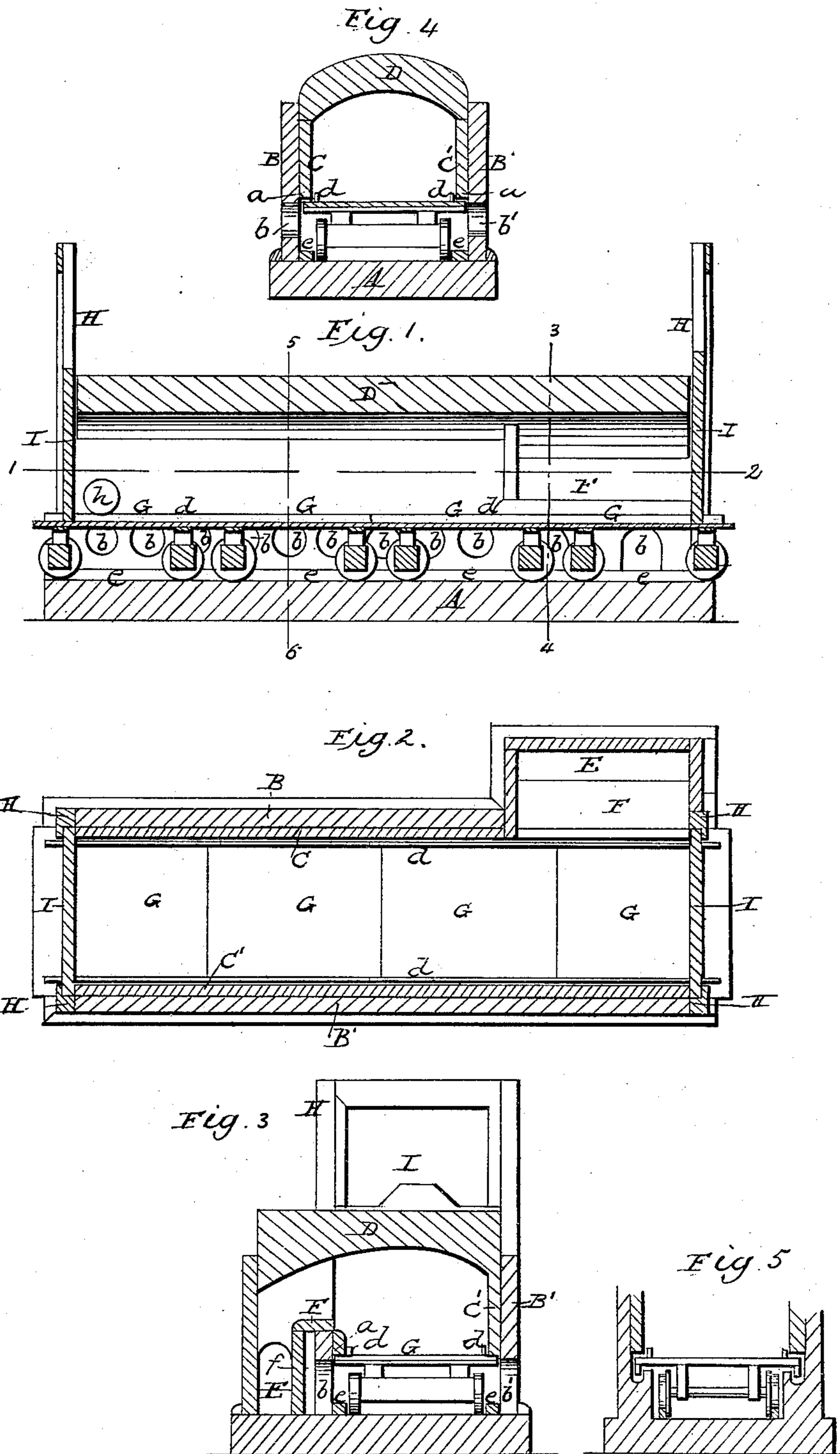


T. R. HARTELL.

Lime Kiln.

No. 22,424.

Patented Dec. 28, 1858.





# UNITED STATES PATENT OFFICE.

THOMAS R. HARTELL, OF PHILADELPHIA, PENNSYLVANIA.

## FURNACE FOR BURNING LIME.

Specification of Letters Patent No. 22,424, dated December 28, 1858.

*To all whom it may concern:*

Be it known that I, THOMAS R. HARTELL, of the city and county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Furnaces for Burning Lime and for other Purposes; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawing and to the letters of reference marked thereon.

My invention consists in forming the bed of a reverberatory furnace of a series of fireproof platforms, the projecting edges of which fit into recesses in the side walls for the purpose of cutting off all communication between the cold air of the lower part of the furnace, and heated air in the upper portion of the same.

In order to enable others to make and use my invention, I will now proceed to describe its construction and operation.

On reference to the accompanying drawing; Figure 1, is a sectional elevation of my improved furnace for burning lime and for other purposes. Fig. 2, a sectional plan on the line 1, 2 (Fig. 1). Fig. 3, a transverse, sectional elevation on the line 3, 4 (Fig. 1). Fig. 4, a transverse section on the line 5, 6 (Fig. 1). Fig. 5, a modified construction of a portion of the furnace.

Similar letters refer to similar parts throughout the several views.

A represents the foundation of the furnace. B and B' the exterior side walls, C and C' the inner side linings, D the arched roof, E the fireplace and F the bridge wall, which separates the fireplace from the body of the furnace. The roof and inner side linings are built of firebrick throughout, the side linings terminating on each side, at a suitable height above the foundation, in an abrupt shoulder *a*, below which points the side walls, which are built of stone or common brick, have either a series of circular openings *b*, *b*, or they may be built with alternate archways and piers.

G, G, G, G, are a series of cars, the frames of which should be made of metal and the tops of soap stone baked fireclay, or firebricks set snugly into iron frames, so as to resist the action of the heat effectually.

The wheels of the cars may bear directly on the smooth upper surface of the foundation, and be guided laterally by the longitu-

dinal bars *e*, *e*, as illustrated in the drawing, or the wheels may be flanged and adapted to rails, as on ordinary railways and as seen in Fig. 5.

On each side of the platform of each car, is a longitudinal strip *d* of fireproof substance, serving to retain the loads of lime stone or other material in their proper position on the cars. These strips are arranged to be as close to the inner linings of the furnace as possible without coming into actual contact. The upper surface of the platform of each car at the opposite sides, should also be as near as possible to the shoulder *a*, where the inner lining of the furnace terminates.

At each end of the furnace, two pillars H, H, are erected, and between these slides a door I, which is arranged to fit to and rest on the platform of one of the cars.

The fireplace may have a grate and the usual door and ash pit, or it may be arranged without a grate and to burn gas-tar and water, after the manner described in the patent of William Hartell and Joseph Lancaster, granted November 23rd, 1852, for rendering gas-tar available as a fuel for glass furnaces.

The opening *f* passes directly through the bridge wall F, communicating at the front and back of the fireplace with the exterior air, and, through an opening *b'*, with the space beneath the platforms of the cars. The bridge is thus exposed to the exterior air, and thereby protected from rapid deterioration through intense heat.

At the rear of the furnace is an opening *h*, through which the products of combustion pass from the interior to any neighboring flue.

I propose to extend the furnace to a length of from eighty to one hundred feet, and to increase the number of cars accordingly. I propose also, in some cases, to build it with two fireplaces, one on each side and at the front end of the furnace.

The cars G with their loads of limestone are arranged in the furnace with the ends of their platforms in close contact with each other, thus forming the bed of the furnace, the loads of stone on the platforms being thus as fully exposed to the action of the products of combustion from the fireplace, as though placed on the permanent bed of an ordinary reverberatory furnace.



The contiguity of the strips *d* to the inner linings of the furnace, and the proximity of the sides of the platform to the shoulder *a* at the terminations of the linings, allow but a trifling amount of the products of combustion to pass to the space beneath the platforms of the cars, and even this small amount is at once expelled, through the openings *b, b*, to the exterior atmosphere. Through these openings, a constant current of cold air is circulated beneath the platforms, and the metal framework of the cars is thus protected from the injurious effects of the heat from the furnace.

In order to prevent the possibility of any escape whatever of the products of combustion, between the edges of the platforms and the sides of the furnace, to the space beneath, the device illustrated in Fig. 5 may be advantageously adopted. In that figure, a strip of fireproof material is placed longitudinally underneath and on each side of the platform of each car. This dips into a body of fine sand contained in a longitudinal recess formed in each side of the furnace. This sand, in combination with the strips, cuts off all communication between the upper and lower portions of the furnace, and, at the same time, offers no obstacle to the forward movement of the car. The recesses, however, require to be replenished with sand periodically.

When the load of limestone on the first car has been sufficiently burned, the doors *I, I*, at each end of the furnace, are raised by any suitable appliances, the front car removed, the whole of the other cars pushed forward, and a car with a new load of limestone pushed in at the rear, when the doors are closed until another car with its burned lime has to be withdrawn, and this periodical removal of one car in front and the introduction of another in the rear may be continued as long as the furnace is in operation.

It will be apparent that the heat is most intense at the front end of the furnace, gradually diminishing toward the rear, which,

owing to the length of the furnace, is at a comparatively low temperature.

Although the process of burning lime in my improved furnace, therefore, may be termed continuous, the heat is imparted to the stone gradually as the cars are pushed forward, and lime burned by such a gradual heat, is well known to be superior to that burned by the sudden, intense heat of ordinary lime kilns.

As the entire products of combustion are brought into active operation on the materials, before they pass from the furnace, it will be apparent, that but little fuel must be consumed compared with that required in ordinary kilns.

Although I have described my improvement as applied to the burning of lime, it may, with equal advantage, be adapted to other purposes, such as burning brick, roasting of ores prior to smelting, baking earthenware &c.

I do not claim broadly a reverberatory furnace, arranged to receive a movable platform or truck, containing the articles or material to be acted upon by the heat of the furnace, as such a device has heretofore been used in the manufacture of glass; but

I claim and desire to secure by Letters Patent, as an improvement in reverberatory furnaces for burning lime;

Providing a recess in the side walls, in which a corresponding projecting edge of the fire-proof, traveling platform fits, in the manner described, for the purpose of cutting off all communication between the heated upper chamber and the cool lower chamber, at the same time presenting no obstruction to the forward movement of the truck and platform.

In testimony whereof, I have signed my name to this specification before two subscribing witnesses.

THOS. R. HARTELL.

Witnesses:

HENRY HOWSON,  
HENRY ODIORNE.