

B. R. HAWLEY.  
KILN.

No. 107,612.

Patented Sept. 20, 1870.

Fig. 1.

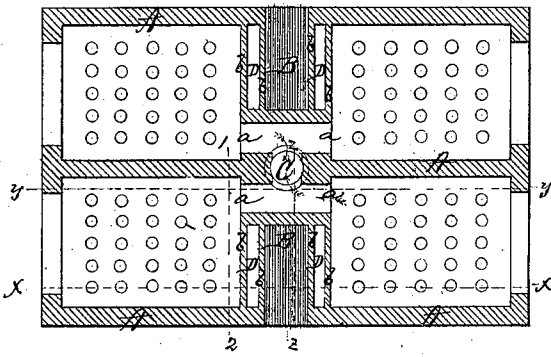


Fig. 4. Fig. 5.

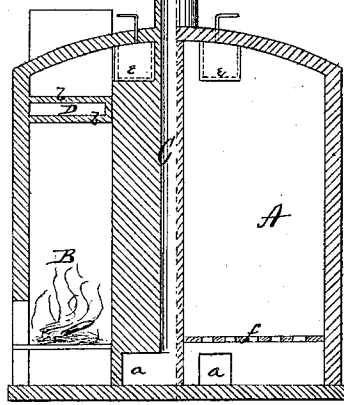


Fig. 2.

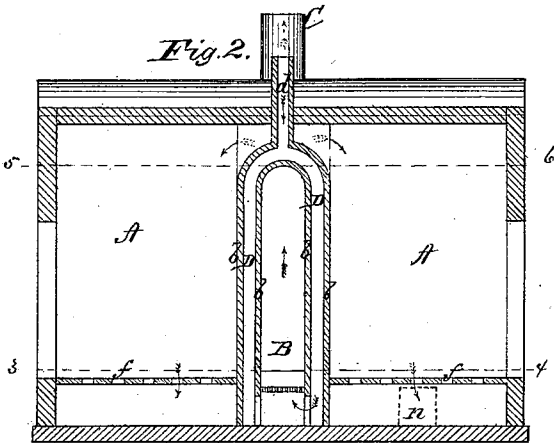


Fig. 6.

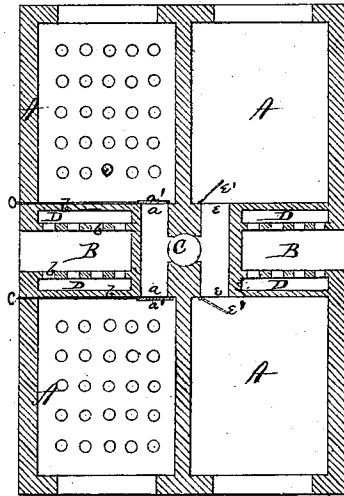
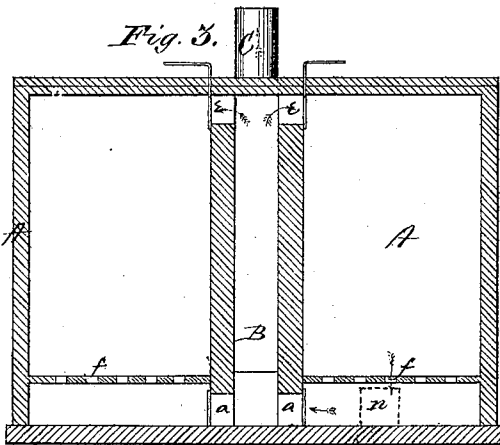


Fig. 3.



Witnesses:  
Ed. Covert.  
J. E. Hutchinson

Inventor:  
Benj. R. Hawley  
per  
Alexander Mason  
Atty.

# United States Patent Office.

BENJAMIN R. HAWLEY, OF NORMAL, ILLINOIS.

Letters Patent No. 107,612, dated September 20, 1870.

## IMPROVEMENT IN KILNS.

The Schedule referred to in these Letters Patent and making part of the same.

To all whom it may concern:

Be it known that I, BENJAMIN R. HAWLEY, of Normal, in the county of McLean and in the State of Illinois, have invented certain new and useful Improvements in Kilns; and do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawing and to the letters of reference marked thereon, making a part of this specification.

The nature of my invention consists in the construction and arrangement of a kiln for burning brick, lime, stone-ware, china-ware, or anything where an even temperature is desired; and, also, for utilizing the heat from a kiln just burned to dry or help to burn the next.

The object of this invention is—

First, to enable parties to burn in all parts of the kiln alike, so as, in brick, to have no soft brick, or eye-brick partly glazed by over heat, but all good, red, well-burned brick, as seen in the center of all ordinary kilns.

Second, to pass the "water-smoke," as it is called, off by a downward flow, in place of upward, putting it effectually out of the way, so as not to retard or trouble in burning.

Third, to allow the use of any kind of fuel, hard or soft coal being just as well as wood, and all reducing the cost at least fifty per cent.

Fourth, to utilize the heat always remaining in a kiln just burned, so as to dry out or take off the water-smoke from the next kiln.

In order to enable others skilled in the art to which my invention appertains to make and use the same, I will now proceed to describe its construction and operation, referring to the annexed drawing, in which—

Figure 1 is a ground plan of the building, showing four apartments or kilns, A A, with two furnaces, B B, each furnace supplying two kilns, and all the kilns being connected with one central smoke-stack, C, through the openings *a a*.

Figure 2 is a longitudinal vertical section, cutting the building through line *x x*, fig. 1, showing fire-box or furnace B and double wall *b*, surrounding the same, leaving an air-chamber, D, around the fire-box, designed to supply air for combustion.

The air is drawn downward from the flue *d* through the air-chamber D, under the grates, the usual opening into ash-pit being, of course, kept closed. This device is designed to accomplish two things: first, to cause a current of cold air to impinge against the top arch of the fire-pot, so as to keep its temperature below a melting-heat, and thus preserve the wall; and, second, to supply heated air for combustion, and thus be able thereby to burn all the gases or smoke.

This figure also shows the open brick floor *f*, in each kiln, to allow heat to pass to the bottom of kiln.

Figure 3 is also a longitudinal vertical section, cutting fig. 1 through line *y y*, just back of fire-box, and showing the passages for the heated air and smoke to pass into and through the kiln.

*e e* are these passages from the fire-box B into the kilns, at the top; and

*a a*, the passages at the bottom, from the kilns to the smoke-stack C.

Figure 4 is a transverse vertical section of one end of a kiln, cut at the center of fire-box, as seen by line *z z*, fig. 1, showing opening *e*, from fire-box into kiln, and opening *a*, from kiln into smoke-stack.

Figure 5 is also a transverse vertical section of back end of one kiln, cutting fig. 1, at line 1 2, showing the openings *a e*.

Figure 6 is a horizontal section, one side cutting the kiln just above the floor, through line 3 4, fig. 2, showing openings *a a*, with their dampers *a' a'*, into smoke-stack C.

The other side cuts the building through line 5 6, fig. 2, showing openings *e e*, with dampers, *e' e'*, for the same.

The theory of this kiln is founded upon the common natural law of gravity in fluids, air among the rest. We say of water, that it seeks its level, and when at a level, and still, we always find the warmest at top and the coolest at bottom. The application of this law to heated and rapidly-flowing air has not been fully appreciated; but it is just as true in its action, under a temperature of 1000° or 2000° Fahrenheit, as from 1° to 100°. Therefore, if we wish to cook, bake, or burn any article whatever in a room, small or large, what would this law indicate? As it is very desirable that all parts of the kiln should burn alike, the kiln must be made perfectly tight, and particularly so at the top, as the hottest air must rise. An opening, *e*, is then made, to admit the heat or fire, at one end, just below the ceiling. Another opening, *a*, is then made out of the room, at the bottom, and connected with a smoke-stack, C.

The fire is built entirely outside the kiln, and arranged so that, when the heat rises, it must enter the room at the top, and by its gravity it will flow along the entire ceiling, and then come down in a stratum, covering the entire room, just in proportion to its temperature, the coldest always at the bottom, and when it comes to the bottom, it still being much above the temperature of the external air, the same law carries it up the stack to the outer world again.

It will now be observed that the heat of one kiln is utilized in the other by opening the connections at *e e*, between the two kilns at the top, one kiln being

hot and the other cold. The outlet *a* from the bottom of the hot kiln being closed, and then an opening, *n*, made under the bottom of the hot kiln, to admit cold air, by the same law it flows over the entire floor, and rises in a stratum, as it becomes heated by the brick, and passes out at the top into the top of the next kiln, and then down and out, as before.

By the arrangement of the four kilns and two furnaces, as shown and described, the process of burning can be carried on without interruption. In one kiln the drying, in the next burning, the third cooling, and in the fourth emptying and filling.

Having thus fully described my invention,

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

1. The combination and arrangement of the kiln A, furnace B, partition *b*, perforated bottom *f*, and chimney or smoke-stack C, all constructed substantially as shown and described, and for the purposes set forth.

2. The method herein described of utilizing the heat of kiln already burned, by introducing cold air below the heated mass, and passing the heated air, as it rises above the body of the heated material at the top of hot kiln A, by openings or connections, into the top of adjoining kiln, filled with green, dried, or not burned material, and passing it downward through said material, substantially as described.

3. The air-chamber D, surrounding the fire-box B, substantially as and for the purposes herein set forth.

4. The arrangement of the four kilns, A A, with the two furnaces, B B, openings *a a* and *e e*, dampers *a' a'* and *e' e'*, and smoke-stack C, all substantially as shown and described, and for the purposes set forth.

In testimony that I claim the foregoing, I have hereunto set my hand this 31st day of August, 1870.

Witnesses:

EDM. F. BROWN,  
C. L. EVERT.

B. R. HAWLEY.