E. C. STERLING.

Brick Kiln.

No. 109,150. Patented Nov. 8, 1870.

Fig. 1.

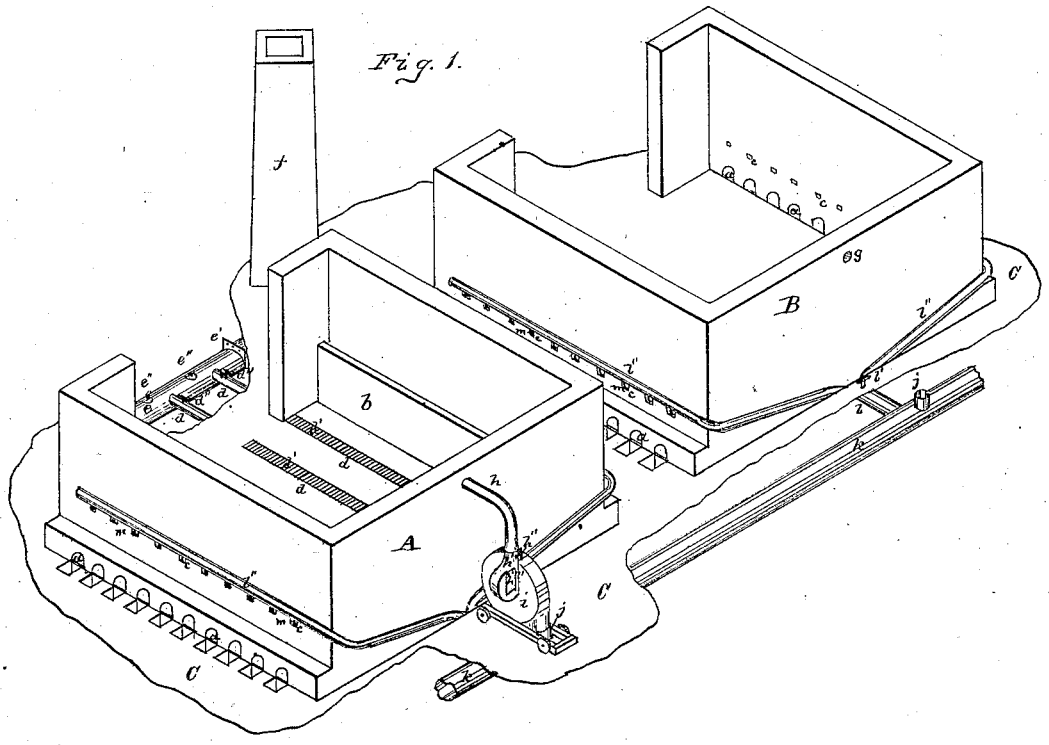
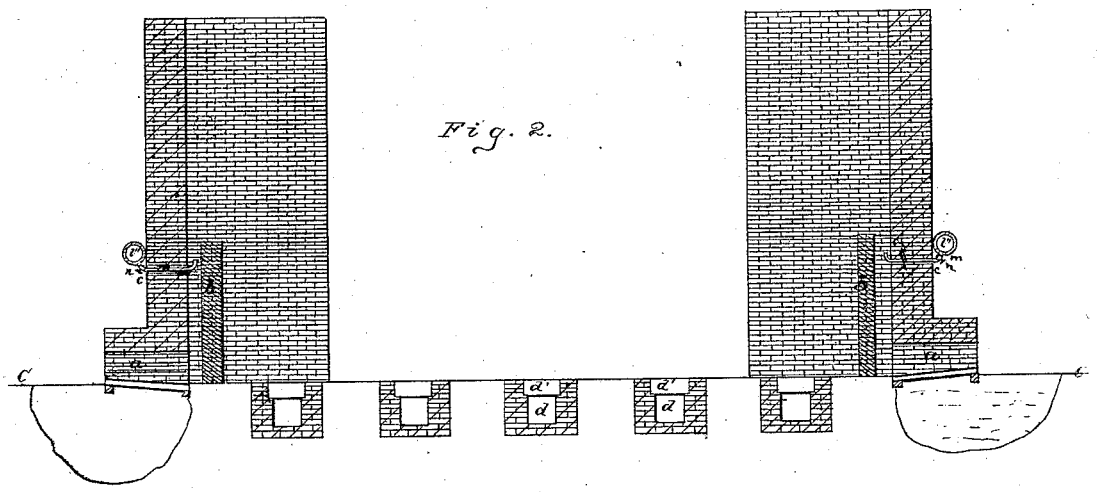


Fig. 2.



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Letters Patent No. 109,150, dated November 8, 1870.

IMPROVEMENT IN BRICK-KILNS.

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

I, EDWARD C. STERLING, of St. Louis, in the county of St. Louis, and State of Missouri, have invented certain new and useful Improvements in Brick-Kilns, of which the following is a specification.

Nature and Object of the Invention.

My invention relates to the means of burning bricks in such a manner as to produce a very large percentage of bricks of the first quality, and at the same time to considerably reduce the amount of time and fuel used.

My invention consists—

First, in a new construction of down-draught kiln; and

Secondly, in the construction and arrangement of an apparatus by means of which a blast of any desired temperature may be applied to any one or more kilns of a number in the same yard, the apparatus being so arranged that the blast may be heated by being drawn through any other kiln of the number.

General Description with Reference to the Drawing.

Figure 1 is a perspective view of my improved down-draught kiln A and a common brick-kiln, B, to which my blast-apparatus is applied.

Figure 2 is a section of the kiln A, somewhat enlarged, taken through two of the furnaces and peep-holes.

A is my new form of down-draught kiln.

B is a common brick-kiln, such as is ordinarily used for burning bricks.

C is the surface of the ground.

Down-draught kilns have heretofore been constructed small in size and arched over the top, a down-draught being caused by a small chimney, which communicates with one or more horizontal flues beneath the kiln.

The furnaces in this form of kiln do not differ essentially from those in use in common brick-kilns, except that a perpendicular bridge-wall is built across the kiln a little distance from the inner ends of the furnaces to force the products of combustion upward to near the top of the kiln, from whence the heated gases descend to reach the flue or flues beneath the kiln.

These down-draught kilns are necessarily small, as the draught caused by a chimney acts to concentrate rather than diffuse the heated currents, and for this reason a kiln of this form much over ten feet in width burns the bricks very imperfectly in certain parts of the kiln out of the direct lines of draught, which lines of draught are from near the top of the kiln to the flues beneath it, leaving portions at the bottom between the flues, and in the corners and at the ends, only partially burned.

The ordinary down-draught kiln now in use has capacity for from fifteen thousand to sixty thousand bricks, and is not more than half the width of a common brick-kiln; but even to support the narrow crown-arch extending from side to side, the walls are necessarily built very thick, and further strengthened by chains and braces to withstand the outward pressure of the arch, which is very trying, owing to its frequent expansion and contraction, caused by extreme change of temperature.

These provisions cause the down-draught kilns to be very expensive of construction, and also very inconvenient, and consequently expensive to fill and empty, as the bricks have to be carried in and out by hand, there being no entrance for a cart, as in the common brick-kiln.

Down-draught kilns burn the bricks with much more uniformity than common kilns, and with a saving of fuel, but, owing to the greater expense of construction and operation, they are at present only used for fire-bricks.

The cause of the uniformity of action in down-draught kilns is that the heat from the furnaces does not come in direct line upon any of the bricks, as upon the arch-bricks in the common kiln, but the heated currents in the down-draught kiln after leaving the furnaces are mingled and spread out in the space between the bridge-wall and side of the kiln, so as to operate equally across the whole breadth of the kiln, and descend from thence to the flues beneath.

By my new construction of down-draught kiln, and combining a blast therewith, I am enabled to use the down-draught principle in kilns of the same width as common brick-kilns, (of a size to hold two hundred thousand or more bricks,) and which can, by having the top open and an opening, say fifteen feet wide in one side, be filled and emptied with the utmost facility; and as there is no permanent cover and consequent side-strain upon the walls, the latter are made as thin as those of a common kiln.

In my down-draught kiln, A shows the position of the furnaces, which are usually about seventeen inches wide and three feet deep from front to back, extending through the outer wall of the kiln.

b are bridge-walls extending across the kiln from side to side, about six inches from the furnace-wall, and extending say five feet upward from the level of the furnace grate-bars.

At about the height of the peep-holes of a common brick-kiln, say three feet above the bottom of

the furnace, I have horizontal holes, *c*, piercing the outer walls.

These holes *c* may be placed in a higher or lower position, as may be found most suitable, or may lead directly into or between the furnaces.

The holes *c*, besides their use as peep-holes, as in a common kiln, receive tuyeres or nozzles, by which blasts are thrown into the kiln to diffuse the heat from the hotter to the colder parts of it.

d are flues beneath the bottom of the kiln, running across at right angles to the direction of the furnaces, and parallel with the bridge-walls.

These flues may be eighteen inches deep and have transverse tiles, *d'*, occupying the upper six inches thereof, leaving twelve inches unobstructed for the passage of the products of combustion.

These flues *d* communicate with a flue, *e*, which discharges through a chimney, *f*, that may be common to two or more kilns.

The flues *d* have dampers *d''*, by which they may be partially or wholly closed; and the flue *e* has a damper, *e'*, and covers *e''* to openings communicating with the open air.

g is an aperture shown near the top of the kiln and below the level of the "platting," (or temporary cover made of bricks laid more or less closely,) said aperture being connected by pipes with the suction-aperture of a blower, by which the heated gases may be drawn from the kiln when the bricks have been burnt, so as to cool the bricks and allow their removal much sooner than could otherwise be done, thus throwing open the kiln to a fresh charge.

The hole *g* receives a pipe, *h*, whose other end is connected with a pipe, *h'*, attached to the blower *i*, and communicating with its suction or in-draught aperture.

The blower may be of any preferred construction, but must be capable of operating with a heated blast.

The said blower may be supported on wheels, to aid its removal from kiln to kiln.

In any portion of the pipes *h* and *h'*, between the kiln and the blower, is a damper, *h''*, by which the pipe may be closed, or partially closed, and between the damper and the blower is a register, *h'''*, for the admission of more or less cold air, as desired, so that a blast of any desired temperature may be forced from the blower.

The blower discharges the blast into a pipe, *j*, of which there is one for each kiln, communicating with a horizontal pipe, *k*, preferably beneath the surface of the ground.

The hole *g*, for the suction-pipe of the blower, though preferably located in the position shown, may, if desired, be made in any part of the kiln; and the pipe *h* may be fixed to the kiln, and may be hinged to admit its outer end to be raised from the blower, or the pipe *h* may communicate with the flue *e*, so as to enable the cooling off of the bricks by the continuation of the currents through the flues *d* and *e* after the fires have been extinguished in the furnaces, the damper *e'* being closed in this case.

The pipe *k*, into which the blower discharges, has branches, *l*, leading to the kilns, which latter are preferably located at regular distances on both sides of the pipe *k*.

Each branch *l* has a damper, *l'*, by which it may be closed, and the said branch-pipe ends in two branches *l''*, which occupy positions parallel with the sides of the kiln and above the furnaces.

m are nozzles or tuyeres, which extend from the pipes *l''* and enter or pass through the peep-holes *c*, and whose ends may be turned up, as in fig. 2, to act more directly to cause an upward draught, and this upward turn would be always preferable when the tuyeres are below the level of the top of the bridge-wall.

The tuyeres have valves, cocks, or dampers, *n*, to regulate the blast.

The use of the blast to diffuse the heat from the furnaces to the extremities of the kiln enables me to apply the down-draught principle to an open kiln of usual width, say twenty-five feet inside measure, the top, when the kiln is filled, being made of the ordinary "platting," formed of two or more courses of bricks, which may be laid close and daubed with mud, or temporarily covered in any manner, so as to make an impervious top, the bricks being laid open beneath the top, so as to allow sufficiently free circulation of the heated gases.

In ordinary brick-burning the first operation is to dry the bricks. To accomplish this small fires are kept up in the furnaces, and the temperature carefully watched until what is technically known as the water-smoke has escaped; as, if the process of drying is pushed too fast, the steam is produced in such quantity as to burst or damage the bricks.

By the application of my improvement this operation of drying and heating is performed by forcing the heated blast through the kiln, thus drying and heating the green bricks without the expenditure of any fuel, except what may be required to run the blower, and admitting the degree of heat to be tempered with nicety.

In ordinary brick-burning it is necessary to keep up the fires a sufficient length of time to burn the bricks in the top and sides of the kiln after the lower part of the kiln is burnt, the heat during the latter portion of the time being of no value to the bricks in the lower half of the kiln, and even detrimental to the bricks nearest to the fire to such an extent as to render them almost worthless. Much of the heat escapes from the kiln without fulfilling any useful purpose while some portion of it is reaching the corners, which it does chiefly by conduction through the body of the bricks and air-spaces between them.

Thus, in the ordinary way of burning, time and fuel are wasted and many of the bricks (usually more than half) somewhat over or under-burnt.

This is not the case where the heat is diffused through the kiln by a blast.

Much time is saved by causing cold air to pass through the kiln after it is burnt, to allow the speedy removal of the bricks, as before stated.

The air may be either drawn or forced through the kiln by means of the blower *i* and the pipes and flues connected therewith.

The saving of time by means of the blast air diffusing the heat and in cooling the kiln would amount to about forty per cent. of the time usually expended in burning, and with a corresponding saving of fuel in the drying and burning.

In the case of the down-draught kiln A the drying-blast may be injected into the base-flues (the same being shut off from communication with the chimney) and allowed to escape through the top, or, if the blast is injected through the tuyeres *m* (the furnaces and peep-holes being then closed and the top remaining tight) the escape from the kiln will be had through the base-flues and chimney, as in burning.

In the down-draught kiln A, after the bricks are burnt and it is desired to cool them, the preferable manner of causing air to pass through the kiln would be to exhaust by means of the blower connected with the hole *g*, the furnaces and peep-holes being closed and the covers *e''* of the flue *e* being removed, so as to admit the air; but the air, if preferred, might be drawn out through the base-flues and be allowed to flow in either through the furnaces and peep-holes, or the aperture *g*, or in any other manner.

Common brick-kilns can be easily and cheaply converted into down-draught kilns of my construction by

the addition of bridge-walls, base-flues, main flue *e*, and chimney.

My blast apparatus can be readily applied in any ordinary brick-yard, and to common kilns, as the blast-pipes may be connected with all the kilns in manner substantially as described, though modified as the arrangement of kilns may demand.

I have described my preferred manner of applying the drying-blast to common kilns, but, if desired, the blast may be conveyed into the kiln by the aid of pipes laid in the bottom or pavement of the kiln, and which may be removed when the furnaces are lighted; or flues made of brick, or other material, may be located beneath the pavement, with openings leading upward into the kiln.

I claim—

1. In an open-top brick-kiln, A, the arrangement of an imperforate deflecting wall or walls *b* in the body of the kiln, extending upward from the hearth of the same toward the top thereof and base-flues *d*, in direct communication with the interior of the kiln, substantially as herein shown and described.

2. The shiftable blower *h*, constructed with necks *h' h''* and adjustable register *h''' i*, the pipes *j k l l'*, and nozzles *m*, combined and arranged substantially as shown and described, in connection with two or more kilns, to exhaust the hot gases from any one kiln, and to force said gases, mingled with more or less air, through one or more of the other kilns, as set forth.

In testimony of which invention, I hereunto subscribe my hand.

E. C. STERLING.

Witnesses:

SAML. KNIGHT,

JAMES LUKE.