

(No Model.)

C. H. SEAMAN.  
DRYING KILN.

2 Sheets—Sheet 1.

No. 519,138.

Patented May 1, 1894.

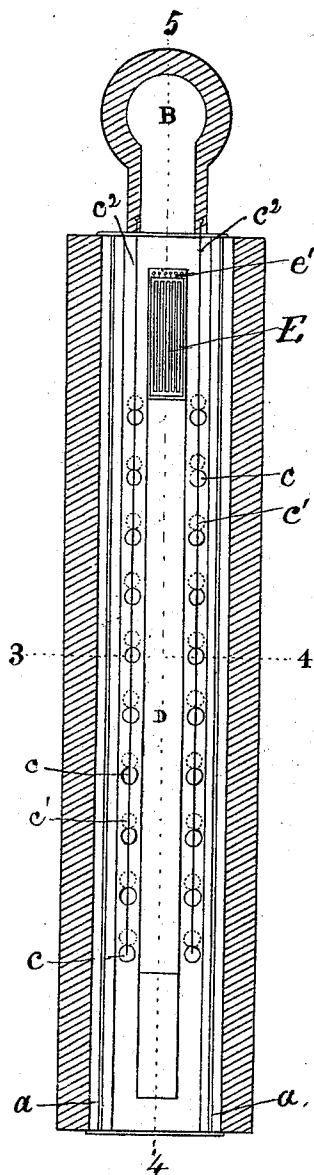


FIG. 1

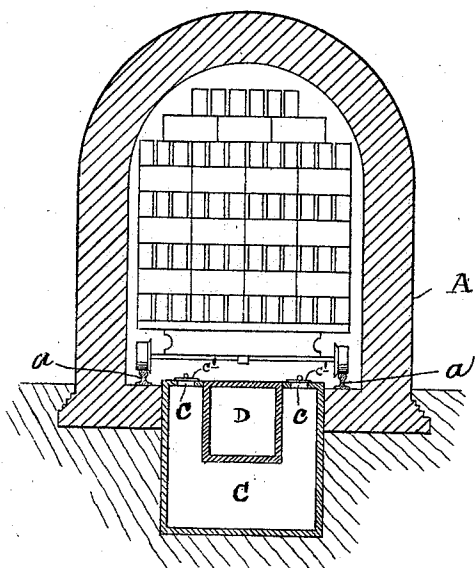


FIG. 2

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Fig. 3.

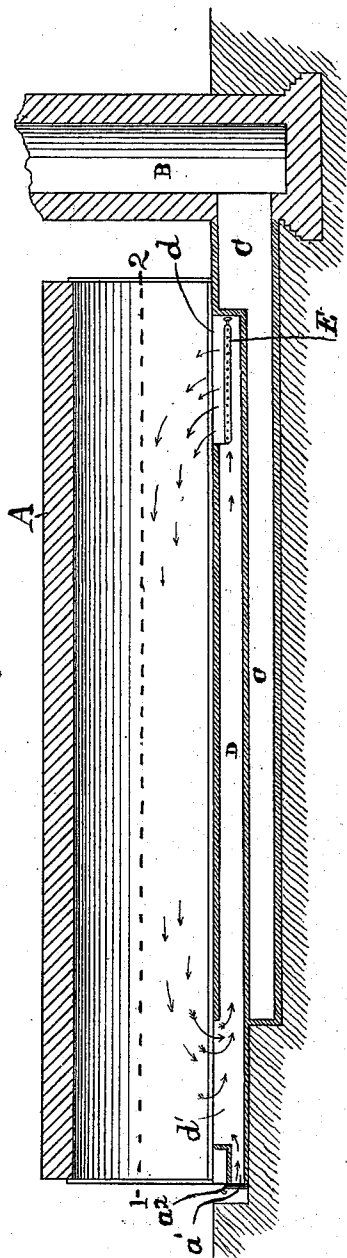
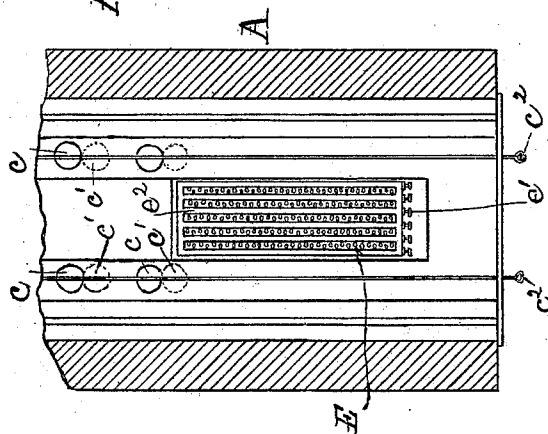


Fig. 4.



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# UNITED STATES PATENT OFFICE.

CHARLES H. SEAMAN, OF ST. JOSEPH, MISSOURI.

## DRYING-KILN.

SPECIFICATION forming part of Letters Patent No. 519,138, dated May 1, 1894.

Application filed February 28, 1893. Serial No. 464,143. (No model.)

*To all whom it may concern:*

Be it known that I, CHARLES H. SEAMAN, of the city of St. Joseph, in the county of Buchanan and State of Missouri, have invented certain new and useful Improvements in Drying-Kilns; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

My invention relates to a class of devices used in the manufacture of bricks, tiles, terra-cotta ware, pottery, and all other articles of a like nature, molded from wet clay, and especially as applied to the manufacture of bricks, by the use of which articles are subjected to a drying process before being placed in a kiln for burning, and also by means of which the manufacture and burning of all articles to which it is applicable may continue during all seasons of the year, without interruption from cold or wet weather.

The object of my invention is to furnish means by which all articles, and especially bricks made from clay or other like material, may be quickly, thoroughly and uniformly dried before being placed in a kiln for burning; which shall be simple, and cheap in construction, durable, and which shall materially cheapen the cost of such drying process, as compared with any device for such purpose hitherto known to me.

My invention consists of various parts and details and combinations of the same, as will be fully described hereinafter, and then pointed out in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar letters of reference indicate corresponding parts in all the figures.

Figure 1. shows a plan view of my invention, through the line 1—2 of Fig. 3. with the top of the drying tunnel removed. Fig. 2. is a sectional elevation (enlarged) of my invention, through the line 3—4 of Fig. 1. showing the general shape of the drying tunnel: the hot air flue; and the vapor passage or flue; together with the position and location of track rails within said tunnel; and also show-

ing by way of example, a truck thereon loaded with bricks in process of drying. Fig. 3. is a sectional elevation of my invention through the line 4—5 of Fig. 1., showing the location of the fire grate, the heat flue, the steam flue, and the stack or chimney. Fig. 4. is a detail plan view (enlarged) of the fire grate or heating apparatus used in connection with my device.

In the drawings A. is a drying chamber or tunnel, which may be of any proper dimensions, and length, and constructed of any proper form or materials. I construct it preferably in the shape of an arch, with vertical sides or walls, as being in all respects the form best adapted to the purposes for which it is intended. At one end of said tunnel A. and at any distance therefrom that may be found desirable, I provide a stack or chimney B. which may be used in connection with one only, or with any desired number of tunnels, as hereinafter described. From said stack or chimney B. is provided a sub-flue or vapor passage C, extending from said stack under the longitudinal center of said tunnel and having its front end closed as shown: said flue or passage C, which may be of any suitable material, terminating at its forward closed end at a point some distance from the forward end of the drying chamber A. and being covered throughout its length, except as follows: Perforations or openings *c*, are provided in the upper side of said vapor passage, and along its opposite margins, for the purpose of allowing the vapor which is generated from the moisture expelled from material in process of drying within said tunnel, to pass down into said vapor passage, and out through the same to the stack or chimney B. as hereinafter described. Said perforations or openings *c* are provided with a series of sliding dampers *c'*, connected with each other and actuated by rods *c''*, in such manner that said openings may be wholly or partially closed at the will of the operator, thus regulating the draft through said openings.

D. is the hot-air or heat-flue constructed of any proper material, and it is parallel with said vapor passage C, which surrounds and incloses its bottom and both of its sides, but not its upper side which is flush with the upper side of said passage, as shown in Fig. 2.

This passage D. is thus much smaller in dimensions than the vapor passage C. The rear end of this hot air passage is permanently closed, and therefore does not lead into the stack; and its front end is closable by the damper or slide  $a^2$ , which may be opened to any desired extent in order to admit air to support combustion. At and within that end of the flue D. which is next to said stack B. is provided a heating furnace E. consisting of any required number of gas or gasoline or other heating pipes, parallel to each other, and with longitudinal spaces  $e^2$  between them as shown, and connected with each other by means of cocks  $e'$ , and having any suitable supply connection not necessary to be shown. The ends of said pipes opposite said cocks  $e'$  being closed, one may be used, or any required number thereof may be connected with each other and operated without using the others of said pipes. Also by means of said cocks  $e'$ , the supply of gas or gasoline, or other heating material may be increased or diminished, so that the heat and combustion gas required may be accurately regulated by the operator. In the cover of flue D. immediately over said furnace E., an opening  $d$  is left corresponding in dimensions with the dimensions of said furnace; so that the heat from said furnace ascends without interruption into that end of tunnel A. which is nearest to stack B. At the opposite end of flue D. a corresponding opening  $d'$  is provided in its cover, adapted to allow the passage into and through flue D., of the heated air within said tunnel. Said tunnel or drying chamber is provided with parallel rails  $a$ , running longitudinally throughout its length, by means of which trucks loaded with undried material, may be run into and out of the tunnel; and the opposite ends of the tunnel may be closed by any appropriate means and a cold air pipe  $a'$ , and stop cock or damper  $a^2$ , are provided, opening into said tunnel at that end thereof which is opposite the stack B., and adapted to allow ingress into said tunnel or drying chamber of fresh air when desired by the operator.

Having described my invention I will now describe its mode of operation.

Having filled said tunnel with material to be dried, the furnace E is lighted in any convenient way, as by temporarily raising the rear closed end of the drying chamber, or opening any hole or door in such end. The air is then or just before admitted into flue D by opening the cock or damper at the front of the apparatus, in order to support the combustion of the gas or liquid fuel. The hot air and the combustion gases therefrom, at once, (because of the tendency of the burners to create a vacuum in the flue D, and the consequent violent rushing in of the air,) rise to the top of the tunnel, creating a straight direct draft through flue D: and inasmuch as there is no stack connected directly with the drying tunnel or chamber and consequently

no direct or other outlet from the rear end of this chamber, the hot air and the gases thus risen are forced along from the rear to the front of this chamber, and so through it as indicated by the arrows therein (see Fig. 3): thence downward through opening  $d'$ , where they are driven through the flue D, by the force of the in-driven current of the air entering, and in the same straight line course to the burners as above stated, and then again through the spaces  $e'$  between the lines of burners as before. In this way, the air which had previously passed through the furnace and heated, now becomes re-heated or superheated, and again passes into the tunnel or chamber, and again and continuously through said flue D. This heated, superheated and re-superheated air passing through and around the material in the tunnel constantly and repeatedly lessens and dries the moisture out of the material; and such moisture as may remain at any stage of the operation, tends by gravity, as well as by the action of that heated air which is less moist, to be forced downward and to find a lower level than the drier portions of the gaseous contents of the apparatus, and hence to pass down through the perforations or openings  $c$ , in the top of the passage C., and thence out through said passage to the stack B., which is located beyond the tunnel, and has no connection with it except by means of this under passage C. The front end of passage C. being always closed, it will readily be seen that the air admitted to support combustion does not directly enter this passage but enters the open front end of the passage D.: and the inlets or openings  $c$ , into the passage C, are on its top and out of the direct route of the incoming draft of air: and these openings  $c$ , are at the sides of and flush with the top of flue D: and the operator can at will close said openings or open them to any desired degree. By these means, there is a constant passage of heated and superheated air around the materials in the tunnel, until they are thoroughly dried; and any excess of moisture is carried off; so that this invention avoids what those experienced in brick making have found to be a great difficulty and a great loss, namely; the settling of vapor in the bottom of the chamber, and thereby the preventing of the drying of the lower courses of the bricks: such settling serving to saturate the bricks which need to be dried, and thereby to soften them, and allowing them to be crushed and damaged by the weight of those which are being dried above them. To take away this vapor, without at the same time losing the benefit of the hot air, and also at the same time to continuously superheat the air passing through and through the chamber, is of self-evident importance and value. The draft toward and through the take up or stack being entirely from the sides of the chamber through the openings  $c$ , appears in practice to act almost entirely upon the condensed vapor, and but

little on the hot air: and there seems to be no conflict between the two drafts: on the contrary they seem to simply supplement and aid each other to attain the end sought.

I claim—

1. In combination with a drying chamber having the described bottom flue provided with the openings *d, d'*, the hot-air passage D communicating therewith as set forth, and having its rear end closed and a heating furnace therein in its upper side, and the sub-flue or vapor passage C, extending from the stack and located at both sides of and under the hot air passage or flue D, to near its forward end, all substantially as set forth.

2. In a kiln drier, in combination with a drying chamber or tunnel with a stack or chimney beyond and outside of the same as set forth, a vapor passage C. beneath such chamber and parallel therewith, a hot air passage or flue surrounded at its sides and bottom as shown and described by such vapor passage, this vapor passage extending to and terminating at its rear end in said chimney and constituting the only connection between the drying chamber and chimney; the upper side of said vapor passage being flush with the bottom of said chamber and having openings therein to communicate with said chamber,

and provided with dampers to open and close said openings as set forth, said hot-air flue communicating near both of its ends with the inside of said chamber, by openings *d, d'* in its top at its ends, and a furnace in one of its ends operating to draw a current of hot air repeatedly through the chamber and through the hot air flue, all substantially as described.

3. In a drying kiln, the combination with a drying chamber or tunnel, of the vapor passage C beneath such chamber and parallel therewith, having its upper side flush with the bottom of the chamber and provided with openings *c*. to communicate with said chamber, and with dampers *c'* over said openings, the stack or chimney B, located beyond and outside of the tunnel, the heat flue D. located within said passage *c*. and having the openings *d, d'*, near its opposite ends directly into the drying chamber, the fresh air inlet *a'*, and its cock or damper, the combination being and operating as set forth.

In witness whereof I have hereunto set my hand this 14th day of February, A. D. 1893.

CHARLES H. SEAMAN.

Witnesses:

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VINTON PIKE.