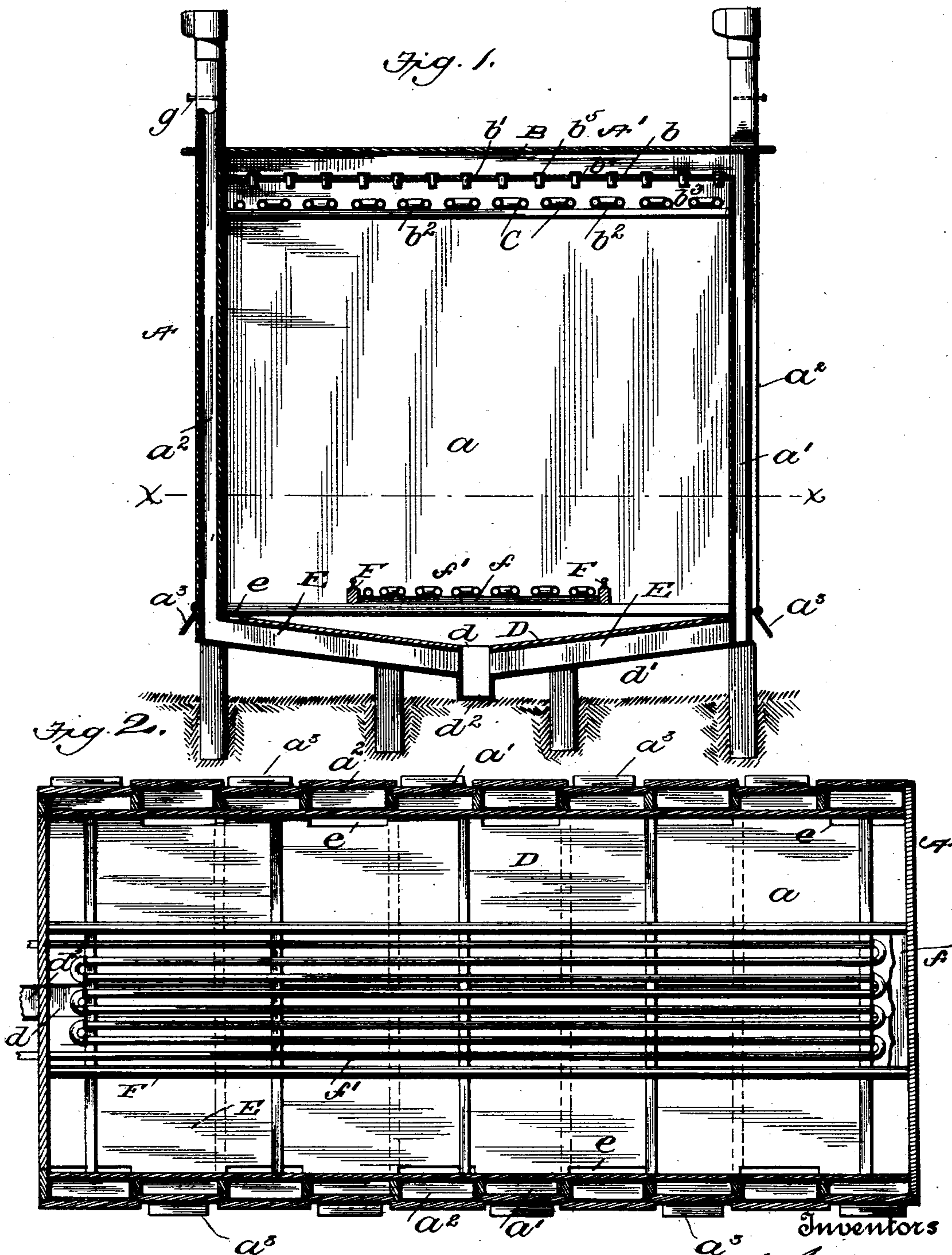


(No Model.) W. G. GALLOWAY & W. A. LEARY.  
A. E. GALLOWAY, Executrix of W. G. GALLOWAY, Deceased.  
KILN.

No. 541,436.

Patented June 18, 1895.



Witnesses  
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# UNITED STATES PATENT OFFICE.

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ANNA E. GALLOWAY EXECUTRIX OF SAID WILLIAM G. GALLOWAY, DE-  
CEASED.

## KILN.

SPECIFICATION forming part of Letters Patent No. 541,436, dated June 18, 1895.

Application filed February 9, 1895. Serial No. 537,822. (No model.)

*To all whom it may concern:*

Be it known that we, WILLIAM G. GALLOWAY and WILLIAM A. LEARY, of Norfolk, in the county of Norfolk and State of Virginia, have invented certain new and useful Improvements in Kilns; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention contemplates new and useful improvements in kilns and is applicable for treatment of brick and clay products, and lumber, and for general drying purposes.

The object of the invention is to provide an improved natural "down-draft" kiln in which the cold air will be brought into the kiln at the top thereof and will pass downward equally at every point throughout the length and width of the kiln, said air being heated before coming in contact with the articles to be dried.

A further object is to prevent unequal air-currents in the kiln and also to insure the vaporization of the moisture in the lower portions of the material being dried, and in the case of bricks prevent softening and crushing of the lower tiers, thus insuring equal drying at every point.

These objects we accomplish by providing a kiln with an upper reservoir or plenum of air extending over the kiln. The floor of this reservoir, which forms a supplementary roof for the drying chamber of the kiln, is perforated and air is introduced from the outside of the kiln through air flues extending up the sides of the building. Beneath this perforated floor of the reservoir is a suitable heating medium of single or double rows of steam-pipes. The floor of the kiln is tapered and made double forming ducts which communicate with outlet flues. A gutter extends longitudinally along the center of the floor at the vertex thereof beneath a corresponding space or opening between the inner portions of the inclined sides of the floor. Above this floor and between the tracks is a solid deflector or partition over which is a lower heating medium.

The invention comprises the novel features

of construction and also the combination and arrangement of parts, substantially as hereinafter fully set forth and particularly pointed out in the claims.

In the accompanying drawings, Figure 1 is a vertical sectional view of our improved kiln. Fig. 2 is a horizontal sectional view on the line *x x*, Fig. 1.

Referring to the drawings, A designates the kiln or building having the drying room or chamber *a*, an outer roof *A'* and two series of air-inlet flues *a'*, and outlet flues *a''* extending perpendicularly along or in the side walls of the building each of said series of flues on one side of the building being preferably staggered relatively to the corresponding series on the other side. Ordinary dampers *a'''* are arranged at the lower ends of the inlet flues *a'*. These latter flues extend to the top of the building and open into a cold-air chamber or reservoir B, extending over the entire top of room *a*, its floor or bottom *b* being located beneath the roof *A'* and forming a supplementary roof for the chamber. This floor is provided with numerous small holes or perforations *b'*. Immediately beneath this perforated floor is the heating medium C, which is shown as composed of steam pipes *b''* extending longitudinally through the building above supporting joists or beams, as *b'''*. In the holes or perforations *b* are fitted short tubes *b''''* having upper flanged ends *b'''''*. These tubes project through the perforated floor and beneath the under side of the latter sufficiently far to allow the hot air in the chamber to be pocketed between the strata of cold air and the under side of the floor or supplementary roof, and thus insure downward circulation.

The floor D of the room A is inclined from the sides to the center, forming an exaggerated V in cross-section, a continuous space or opening *d* being left between the two inclined sides of the floor. This floor is made double, that is, a second correspondingly inclined floor *d'* is located beneath the floor D and to the inner edges of the inclined sides thereof, directly beneath the opening *d*, is connected a continuous longitudinal gutter *d''*, which extends the full length of the building and is passed out of one end thereof. This gut-



ter is preferably formed of metal, or other material suitable to provide for condensation of moisture in the air, such condensation being promoted by reason of the contact of the  
 5 outer atmosphere with the exterior of said gutter, which latter extends beneath the floor. Likewise the outer floor is preferably metallic. The double floor is formed into ducts E which open at their outer ends into the out-  
 10 let flues  $a^2$ , which latter extend upward through the roof A' of the building. If desired each alternate duct E may have an opening  $e$  formed by cutting away a portion of the inner floor D adjacent to the side walls of the  
 15 building. If so constructed these ducts on the opposite sides of the building are arranged in staggered relation.

F, F, designate the longitudinal track-rails for the trucks (not shown) and between  
 20 these rails is a solid deflector or partition  $f$  which entirely covers the intervening space, and upon this deflector is a lower heating medium  $f'$ , shown as consisting of steam-pipes.

25 In practice the space or opening  $d$ , which we will term the first outlet, should be of greater area than the combined area of the inlets through the perforated floor of the air reservoir, and the areas of the inner ends of  
 30 lateral ducts E adjacent to the gutter and said space or opening are larger than that of the latter.

The operation is as follows: The cold-air passes up through the inlet flues  $a'$  into the  
 35 chamber or reservoir B, forming a plenum, and the upper heating medium beneath said reservoir draws the air downward through the perforated floor of said reservoir equally at every point. The cold air is forced down-  
 40 ward by the expansive force and compression created by the heating medium, and after passing through or in contact with the material under treatment passes through the space or opening  $d$  and thence through ducts  
 45 E up and out the top of flues  $a^2$ . When the floor is made with the additional outlet openings  $e$  a portion of the charged air passes out at those points. The flues  $a^2$  are also provided with dampers  $g$ , which enable the draft  
 50 to be controlled, thereby facilitating the drying of the various articles under treatment. The moisture is removed from the air by condensation effected either in the gutter, the ducts E, or the outlet flues, and falling  
 55 into said gutter is conveyed from the building. The lower heating medium vaporizes the moisture in the lower tiers of material and forces it upward and outward toward the side-walls of the kiln and makes the same  
 60 pass downward to the central gutter, while a portion will pass out through the openings  $e$ . In drying bricks the lower heating medium prevents the softening and crushing of the bricks in the lower tiers. The deflector or  
 65 partition between the track-rails and beneath the lower heating pipes is preferably covered

with a non-conducting material which prevents the heat from radiating downward to the lower outlet and thus said heat is forced  
 70 to act on the lower tiers of material. Thus it will be seen that in our improved kiln heat and gravity and condensation work in unison. By providing the plenum or reservoir of cold or tempered air at the top of the kiln and the floor of the reservoir with numerous  
 75 perforations an equal distribution of air at every point is obtained, and thus unequal distribution of air is avoided. A natural down-draft kiln is thus obtained and in consequence the drying operation can be quickly accom-  
 80 plished in a thorough manner. The area of the first outlet being greater than the combined area of the inlet and the lateral ducts being of greater area than the said first outlet a thorough air circulation is constantly  
 85 maintained.

We claim as our invention—

1. A kiln having an upper air-chamber, a heating medium beneath said chamber, a lower inclined floor having a central outlet  
 90 opening and air-ducts leading therefrom, as set forth.
2. A kiln having a room and an upper perforated floor or supplementary roof forming an air chamber, air-inlet flues opening into  
 95 said air-chamber above said floor, a heating medium beneath said upper floor, and a lower outlet at the bottom of said room, as set forth.
3. A kiln having a room, an upper air-chamber, an upper heating medium, and air-inlet  
 100 tubes leading from said air-chamber into said room at points beneath the top of the latter, as and for the purpose set forth.
4. A kiln having an upper heating medium, a lower outlet, and a lower heating medium  
 105 above said outlet and beneath said upper heating medium, as set forth.
5. A kiln having an upper heating medium, a lower outlet, a lower heating medium above  
 110 said outlet, and a deflector between said outlet and lower heating medium, as set forth.
6. A kiln having an upper air-supply, an upper heating medium, a lower air-outlet of greater area than said air-supply, and a lower  
 115 heating medium above said outlet, as set forth.
7. A kiln having an upper air-chamber provided with a perforated floor, an upper heating medium beneath said floor, a lower outlet  
 120 of greater area than the combined area of said perforations of said floor, and a lower heating medium above said outlet, as set forth.
8. A kiln having an upper air-chamber provided with a perforated floor, inlet ducts opening into said air-chamber, a heating medium  
 125 beneath said floor, a lower floor having a central outlet space or opening, a longitudinal gutter, and air-outlet ducts, as set forth.
9. A kiln having an upper air-chamber provided with a perforated floor, inlet ducts opening into said air-chamber, a heating medium  
 130 beneath said floor, a lower double floor having a central space or opening, lateral air-



ducts, a central longitudinal gutter, and outlet flues into which said air-ducts open, as set forth.

10. In a down-draft kiln having an upper  
5 air-chamber, an upper heating medium beneath said air-chamber, a lower outlet, a lower heating medium above said outlet and beneath said upper heating medium, and a deflector between said lower heating medium  
10 and said outlet, as set forth.

11. In a down-draft kiln having an upper  
air-chamber, an upper heating medium beneath said air-chamber, a lower outlet, track-  
rails mounted above said outlet, a deflector  
15 or partition between said track-rails, and a lower heating medium on or above said floor or partition, substantially as set forth.

12. The herein-described kiln having an  
upper air-chamber provided with a perforated  
20 floor, inlet flues opening into said air-chamber, an upper heating medium beneath said floor, a lower double floor having intermediate air-ducts and a central space or opening, a gutter connected to said lower floor and extending  
25 beneath the latter, and outlet flues into which said air-ducts open, as set forth.

13. The herein-described kiln having an  
upper air-chamber, a heating medium beneath said chamber, a lower floor having a  
30 central outlet space or opening, air ducts leading from said space or opening and also pro-

vided with openings adjacent to the side-walls of the kiln, and outlet flues into which said air-ducts open, substantially as set forth.

14. The herein-described improved natural  
35 down-draft kiln consisting of the building having an upper perforated floor or supplementary roof beneath the main roof forming an upper air-chamber, air inlet-flues entering  
40 into said building and opening into said air-chamber, heating pipes beneath said perforated floor, track-rails, a solid deflector or partition between said track-rails, heating pipes above said deflector, a lower double deflector  
45 inclined from the side walls to the center and forming a central outlet space or opening and lateral air-ducts, a gutter attached to said floor and extending beneath the latter, air  
outlet flues into which said air-ducts open, said lower floor having alternately-arranged  
50 openings into said air-ducts at the outer ends of the latter, adjacent to the side walls of the building, substantially as set forth.

In testimony whereof we have signed this  
specification in the presence of two subscrib-  
55 ing witnesses.

WILLIAM G. GALLOWAY.  
WILLIAM A. LEARY.

Witnesses:

EDW. R. BAIRD, Jr.,  
J. W. WILLCOX.