

No. 638,831.

Patented Dec. 12, 1899.

C. C. BARBOUR.  
LUMBER DRIER.

(Application filed June 2, 1899.)

(No Model.)

2 Sheets—Sheet 1.

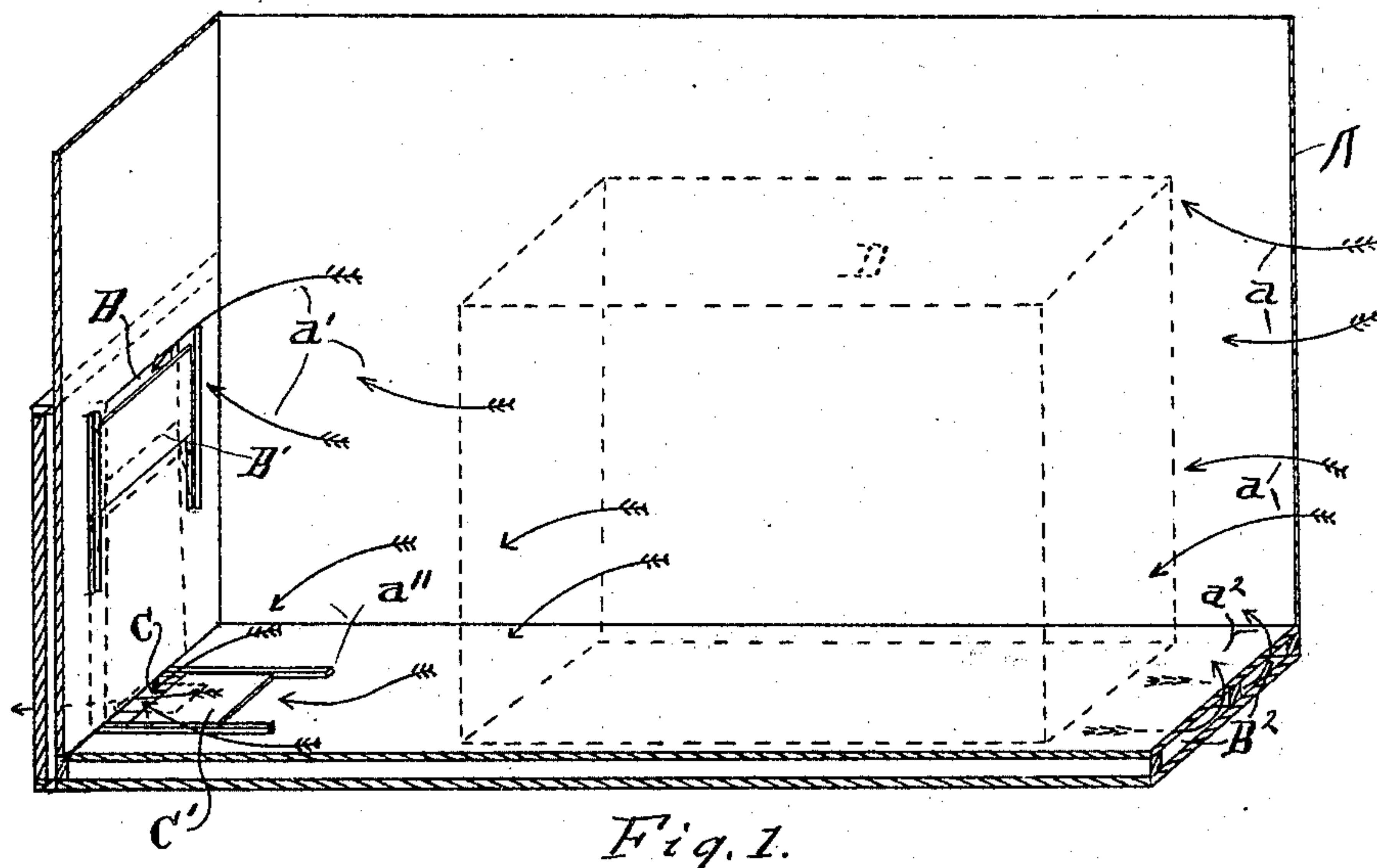


Fig. 1.

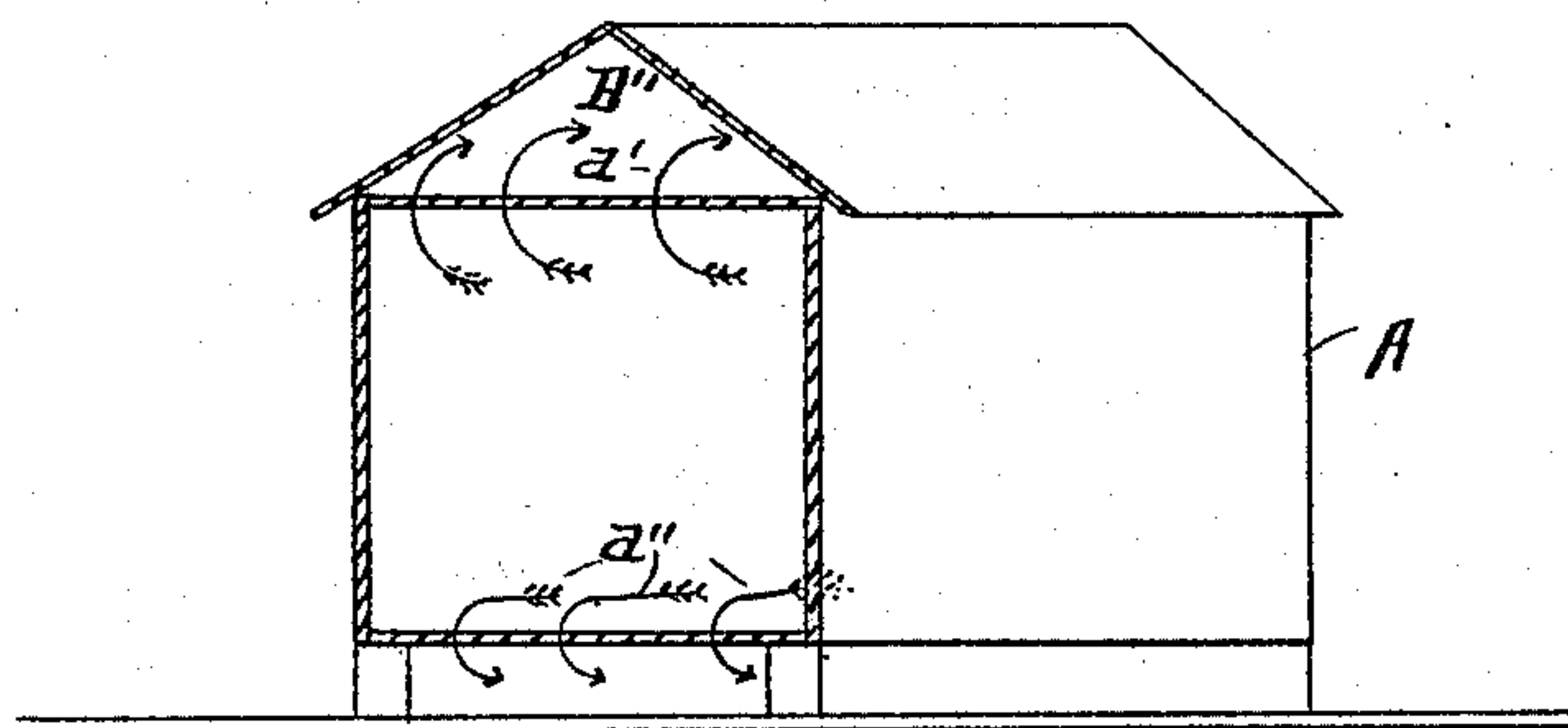


Fig. 2.

Witnesses.

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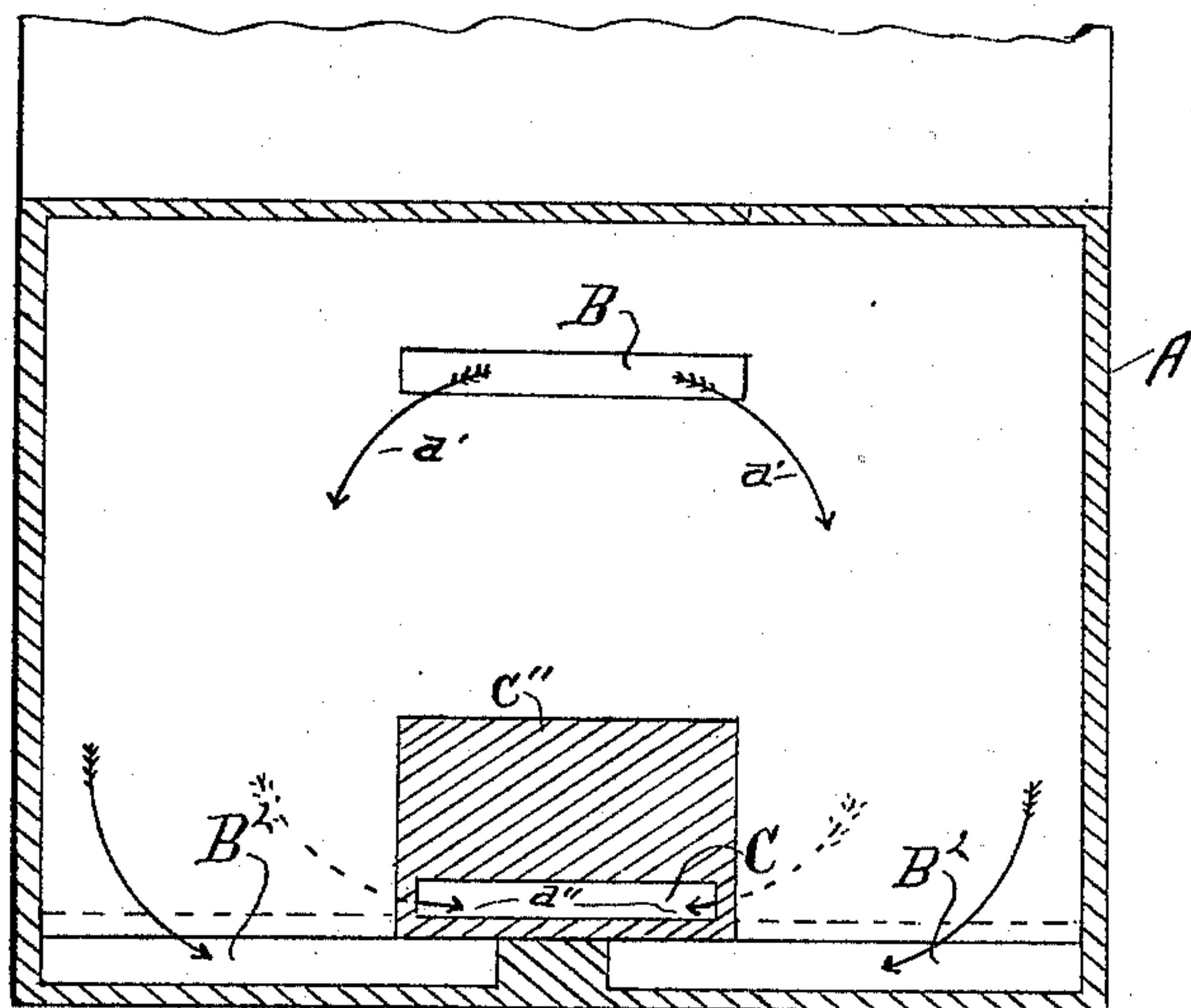


Fig. 3.

Witnesses.

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# UNITED STATES PATENT OFFICE.

CHARLES C. BARBOUR, OF GRAND RAPIDS, MICHIGAN.

## LUMBER-DRIER.

SPECIFICATION forming part of Letters Patent No. 638,831, dated December 12, 1899.

Application filed June 2, 1899. Serial No. 719,134. (No model.)

*To all whom it may concern:*

Be it known that I, CHARLES C. BARBOUR, a citizen of the United States, residing at Grand Rapids, in the county of Kent and State  
5 of Michigan, have invented certain new and useful Improvements in Appliances for and Processes of Drying Lumber, of which the following is a specification.

In the process of forced drying lumber  
10 throws off or has forced from it two sets or genera of gases—namely, first, gases containing saccharin, albumin, and essential oil or the life-giving properties of wood, and, second, gases containing alkali, acetate of lime, and  
15 pyroligneous acids, the destructive elements of wood; and my invention relates to a proper distribution of these gases; and its object is to throw off the destructive gases entirely and return and retain the vivifying or life-giving  
20 gases, and thereby quickly dry the lumber without stain, check, or warp. I attain this result by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a sectional elevation of a kiln,  
25 partly in perspective, showing the distribution of the gases and the outline of a pile of lumber in the process of being dried. Fig. 2 is a modified form of kiln; and Fig. 3 is an end elevation of the kiln, partly in section,  
30 with the outer wall of the vivifying-air flue removed to show how the vivifying air and gases may be conducted back to the current of inflowing air without commingling with the deteriorating-gases when both ports are  
35 placed in the same wall of the kiln.

Similar letters refer to similar parts throughout the several views.

Three several theories are at present followed in kiln-drying lumber. First comes the  
40 ancient theory that as hot air rises it will carry the moisture from the lumber with it if allowed to escape through or near the top of the kiln. This theory is correct to a limited extent; but adherents to it find that the lum-  
45 ber thus dried is brittle, checked, and often-times honeycombed, so that it is difficult to give it a presentable finish, and are at a loss to account for the destruction of their lum-  
50 ber, not being aware that only the saccharin, albumin, and essential oil—the life-giving elements of the lumber—are evaporated with the upwardly-escaping hot air, while the alkali,

acetate of lime, and wood-acids, being heavier than the rarefied air, settle to the bottom of the kiln and virtually saturate the lumber, 55 destroying its fiber and causing it to check, warp, honeycomb, and become in time so brittle that it will scarcely sustain its own weight. The second theory is that all of the gases should be allowed to escape, and for this pur- 60 pose ports are made at the bottom of the kiln, and all moisture and with it all of the gases are carried out, and as the vivifying-gases are not returned the lumber though strong loses its luster, becomes stained, checks and warps, 65 and is, withal, very unsatisfactory when worked up and finished; and the third theory is that all the gases should be returned and passed over and through the lumber in its heated condition, so that the vivifying ele- 70 ments will not be fully lost to the lumber. This theory comes nearer giving satisfaction than the others; but as the destructive gases are returned with the vivifying-gases the lum- 75 ber is found to stain badly and to check and become brittle.

In my process I take a middle ground and act upon the theory that the vivifying-gases should be returned, and, as far as possible, retained in the lumber and the destructive 80 gases should be wholly eliminated from it, or as nearly so as possible. For this purpose I place two sets of ports in my kilns. One port or set of ports is situated at the bottom of the kiln, as at C, and is provided with a 85 sliding cover or valve C', so that it may be enlarged or diminished at pleasure. This port is for the escape of the heavier gases, and for the passage of the lighter gases I place a port or ports, as B, well up in the side 90 wall of the kiln A. This port is also provided with a sliding cover, as B', which may be manipulated to increase or diminish the size of the port. This port is connected with flues B<sup>2</sup>, so arranged that they will carry the heated 95 air and gases that pass into the port B back to position to reënter the kiln A with the inflowing hot air at a. When both ports for the escape of the gases from drying lumber are placed in the same wall of a kiln and one 100 is directly over the other, as herein shown, I place a wall, as C'', around the port C, so that the air from the port B may pass the port C and enter the flues B<sup>2</sup> without commingling



with the air and gases that pass out of the port C. When the kiln is first filled and heat turned into it, I close the port C nearly or quite close and open the port B, so that all  
 5 of the heated air and gases will pass through and back to reënter with the inflowing hot air until the lumber is thoroughly heated through, when I open the port C and partially close the port B, so that all of the heavy gases  
 10 or destroying elements of the wood are carried out into the open air, and thus eliminated from the wood, and all of the vivifying-gases, being lighter, are carried through the port B and back through the flues B<sup>2</sup> to re-  
 15 mingle with the inflowing air and be redistributed upon and through the lumber, thus enabling me to dry the lumber much quicker than by either of the several processes mentioned and at the same time to retain all of  
 20 its vitality and natural luster and without warp, stain, or check, thus enabling me to give to my finished lumber as fine and brilliant a finish as can be placed upon carefully-housed air-dried lumber and with the advan-  
 25 tage that all the destroying elements are eliminated and there is no danger of its becoming paled or stained with age by the effect of the wood-acids and lime.

In Fig. 1, D represents the outline of a pile  
 30 of lumber in the kiln, *a* represents the inflowing hot air as it is being distributed through the lumber, *a'* represents the outflowing gases that carry the saccharin, albumin, and essential oils, *a''* represents the escape of the  
 35 gases carrying off the alkali, acetate of lime, and pyroligneous or wood acids, and *a*<sup>2</sup> represents the return of the saccharin, albumin, and oil to the inflowing hot air. In this figure I have shown the port B directly over  
 40 the port C and by dotted lines between them the outlines of a solid wall which forms two flues passing down from the port B, one each side of the port C, connecting the port B with the flues B'. It is not necessary that the port

B should be placed directly over the port C 45 or even in the same wall. One port may be placed in the side wall and the other in the end wall, if desired, the positions shown in the drawings having been chosen as a mere matter of convenience and as more readily 50 illustrating the operation of the kiln.

In Fig. 2 I have shown the escape of the heavier gases *a''* from the bottom of the kiln and the return of the lighter vivifying-gases through a flue formed below the roof of the 55 kiln.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In combination with a hot-blast dry-kiln, 60 lower ports for the escape of the deteriorating-gases, ports above these for the passage of the vivifying-gases, and flues for carrying said vivifying-gases back to the inflowing air, substantially as and for the purpose set forth. 65

2. In combination with a dry-kiln, lower ports for the escape of deteriorating-gases, upper ports for the passage of vivifying-gases, adjustable covers to said ports, and flues to conduct the vivifying-gases back to the in- 70 flowing air, as shown and described.

3. In combination, a dry-kiln having one port or set of ports so arranged that the deteriorating-gases, as they are forced from the lumber, will be carried off, and a port or ports 75 so arranged that the vivifying-gases will be separated from the deteriorating-gases, and a flue or flues connecting the latter ports with the inflowing-air port to carry the vivifying-gases back to and redistribute them over and 80 through the lumber, substantially as and for the purpose set forth.

Signed at Grand Rapids, Michigan, May 29, 1899.

CHARLES C. BARBOUR.

In presence of—

I. J. CILLEY,

H. OLMSTED.