

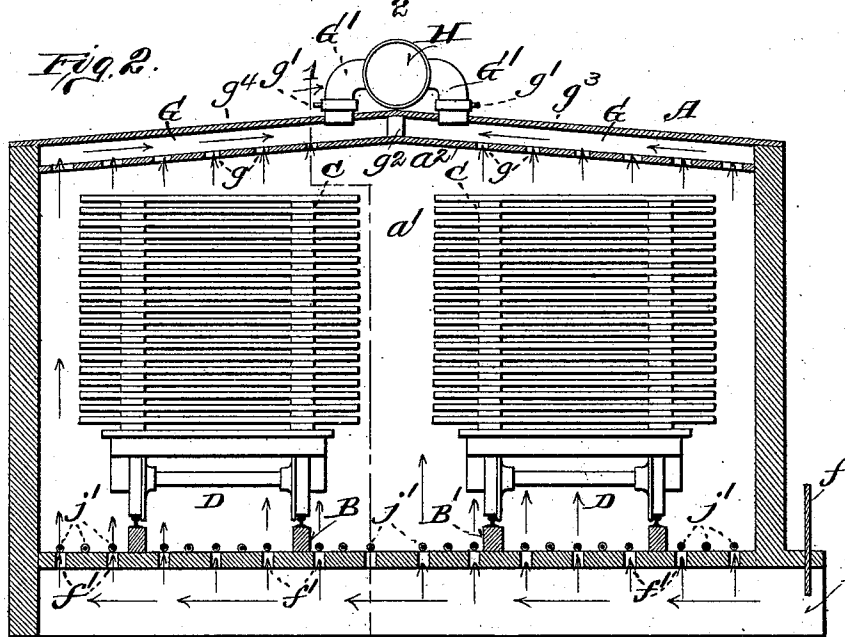
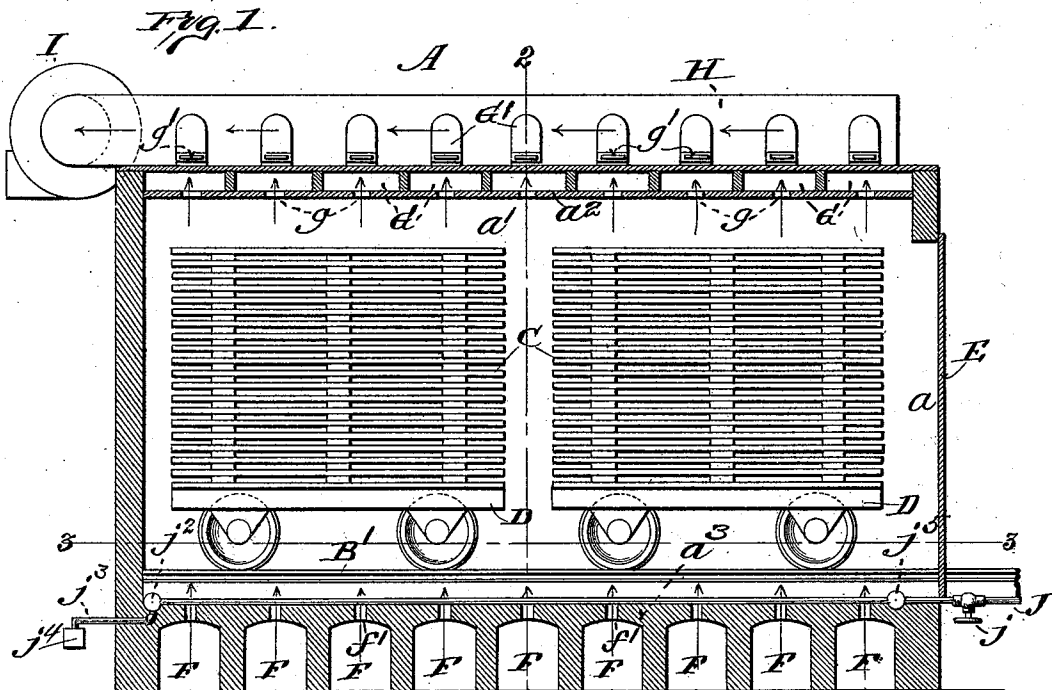
(No Model.)

2 Sheets—Sheet 1.

H. D. WILLIAMS.
METHOD OF DRYING ARTICLES.

No. 528,496.

Patented Oct. 30, 1894.



Attest:

W. J. Kest.
A. T. Bonville

Inventor
Horace D. Williams
By O. D. Moody
Atty.

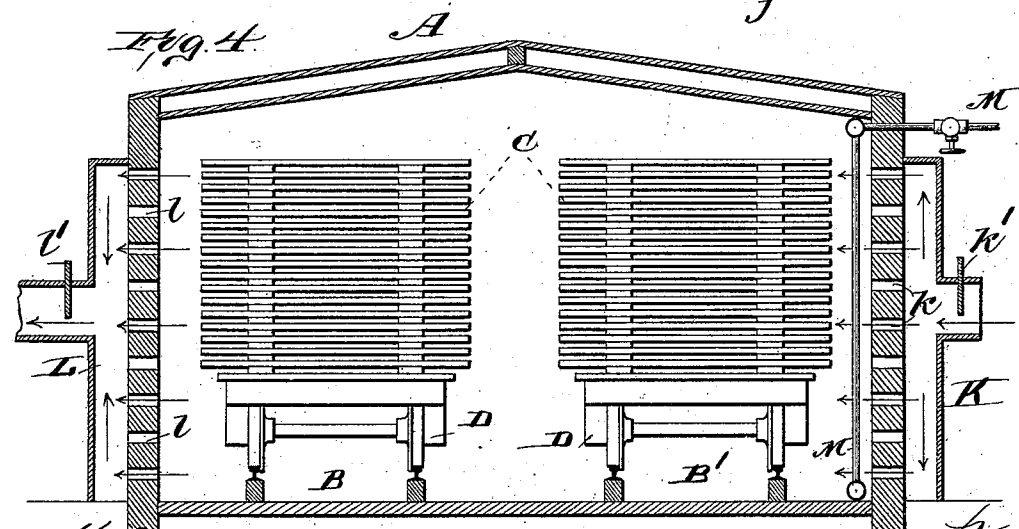
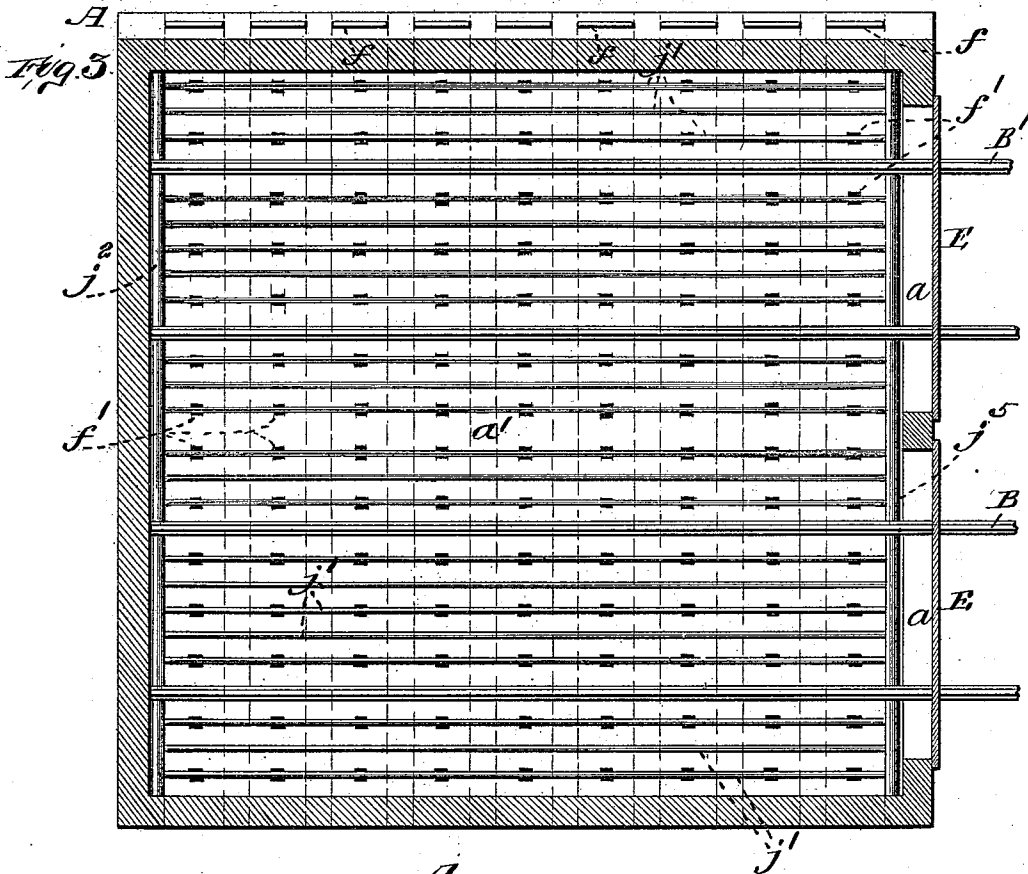
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UNITED STATES PATENT OFFICE.

HORACE D. WILLIAMS, OF POPLAR BLUFF, MISSOURI.

METHOD OF DRYING ARTICLES.

SPECIFICATION forming part of Letters Patent No. 528,496, dated October 30, 1894.

Application filed September 26, 1892. Serial No. 446,961. (No model.)

To all whom it may concern:

Be it known that I, HORACE D. WILLIAMS, of Poplar Bluff, Missouri, have made a new and useful Improvement in Methods of Drying Articles of Various Descriptions, of which the following is a specification.

The method in question is adaptable to various materials, objects, articles, and substances, and especially to barrel-stock, lumber, and other wooden articles. In carrying out the improvement the moisture is removed from the material or article being dried until the humidity thereof agrees substantially with that of the outer atmosphere, or whatever air is used in carrying out the operation, and then the material or article is heated and dried until the requisite degree of dryness has been produced in it. That is, it is necessary to temper the heat in the drying chamber to suit the condition of the material or article being treated; if the material has a certain amount of moisture in it. If, for instance, it is what is termed green lumber—it should not be subjected to a greater degree of heat than that of the existing atmospheric temperature, or of whatever air is employed to effect the drying, but enough of its moisture should be extracted from the material, to assimilate it, in humidity, to the atmosphere, or employed air, and then, after such extraction, heating can be, and is, resorted to, and at the same time a certain amount of air is circulated past the material, and the process is more fully carried out by, gradually, or otherwise, cutting off the air supply and subjecting the material as nearly as is practicable to the influence of heat only until the desired degree of dryness is obtained.

To this end the improved method under consideration consists as follows: The material or article, say barrel staves, to be treated is placed in a suitable drying chamber and a drying-air current whose temperature is substantially not above that of the staves when placed in the chamber, is taken into the chamber, carried past the staves, and discharged from the chamber. The special direction in which the current is conducted with relation to the staves is immaterial so long as the staves are subjected to its drying influence. After the application of the air current has been fairly initiated it will be noticed that

the temperature of the drying chamber falls. This is due to the evaporation of the moisture of the staves, and it continues as long as the amount of moisture in the staves exceeds that of the air-current. After a sufficient amount of moisture has been evaporated to cause the staves and the passing air-current, so far as humidity is concerned, to come into a state of homogeneousness, the temperature in the drying chamber rises to equal that of the outer air or whatever is the source of the air-current. This rise in temperature is a guide to the operator and it informs him the time has come for the application of the heat in conjunction with the air-current, and, accordingly, the staves are now subjected to heat in connection with the air current and until they are dried.

As a practical direction I may say that it has been my custom, when green material is being treated, to apply the air current without heat for a period of about ten days, and then, after noticing the described rise in the temperature of the drying chamber, continuing the application of an air-current, but at the same time raising the temperature in the drying chamber two or three degrees daily for the period of about ten days longer, or about twenty days altogether, and then, if desired, the air current is arrested, and the material subjected to heat only for a day or two. With cooperage partially dried the time for applying the air-current only is necessarily shortened. In determining the fall in temperature in the drying chamber it is better to compare the temperature of the drying chamber with that of the outer air, or whatever the source of the air current, during the night time, or at times when the drying chamber is not subjected to the influence of the sun, which, as can be readily understood, might temporarily cause the temperature within the drying chamber to rise more or less. The rule therefore is: apply the air current without heat as long as the temperature of the drying chamber continues lower than that of the outer atmosphere, and after that period has passed, and the temperature within the drying chamber is substantially the same as that of the air, then apply heat with the air in the manner described until the material is sufficiently dried.

To more fully set forth the improvement under consideration, reference is made to the accompanying drawings, making part of this specification, and exhibiting a desirable apparatus for carrying out the method.

Figure 1 therein is a vertical longitudinal section of the drying chamber or kiln, the section being on the line 1—1 of Fig. 2 which in turn is a vertical cross section on the line 2—2 of Fig. 1; Fig. 3, a horizontal section on the line 3—3 of Fig. 1; and Fig. 4 a view showing a modified construction, the view being a vertical cross section analogous to that of Fig. 2, but showing an arrangement whereby the air-currents are taken horizontally through the drying-chamber instead of vertically as in the first named views.

The same letters of reference denote the same parts.

A represents any drying room or kiln suitable for being operated in accordance with the principle of the improvement. It can be of any desirable shape and proportions and be constructed of any proper material.

To facilitate the handling of the material, the kiln may have railway tracks B, B' to enable the material C being treated to be placed on cars D, to be rolled into and out of the kiln through its doorway or doorways a, a, and E E represent suitable doors for closing the entrance of the interior of the kiln.

The air is usually introduced into the interior a', of the kiln from beneath the same, and discharged through the roof or ceiling a², of the kiln, and the preferable air-admitting arrangement is as follows: F F F represent a series of air-inlet flues arranged, and jointly occupying the space, beneath the floor, a³, of the kiln. In the present instance these flues extend crosswise in the construction and the entrance to each flue is controlled by some means such as the slide f, that is, instead of controlling the flow of the air through the flues F by means of valves or other air-arresting devices at the point of exit from said flues, it is more convenient to control the air-flue by means of a single movable part located at the entrance to the flue. The flues, F, also, instead of being restricted to a certain portion of the space beneath the kiln-floor, unitedly extend beneath the length and breadth thereof, and from each of the flues the air enters the interior of the kiln through openings, f', in the kiln-floor. Said openings may be of the same size, and they, in each flue, are distributed throughout the width of the floor, substantially as shown, thereby to enable the air to ascend into any or all the parts of the interior as may be desired to properly carry on the work. Each flue F has its own series of openings, f', so that when the slide f, belonging to that flue is opened the air can pass from that flue F into the interior of the kiln throughout the length of the flue, or, what is the same thing, throughout the width of the kiln, and so with each of the other flues F. The air delivered into the

kiln-interior, a', can be withdrawn therefrom through a corresponding system of air-outlet flues G arranged in the roof or ceiling of the kiln, that is, the flues G extend crosswise in the kiln and there are openings, g, leading from the interior of the kiln into each of said flues G. Said flues, G, in turn, all connect with a flue H, and by means of an air-moving device, such as the fan I, or any suitable air-shaft, the air can be drawn, from the flue G, into the flue H and thence discharged as desired. The movement of the air from each of the flues G into the flue H is through a flue G', and each flue, G', has means such as the slide g' for opening and closing it. Thus the movement of the air from the kiln can be controlled at any part thereof. If it is desired to withdraw the air from all parts of the kiln all of the flues G' are opened, and if it is desired not to withdraw the air directly from any portion of the kiln-interior the flues G' above that particular portion or portions are closed, thereby directing the outflow through those of the flues G, G', which are left open, and by closing all of the flues G' there is no outflow practically of air from the kiln-interior. By this means it will be seen that control is had not only of the entire kiln-interior but also of any particular portion thereof so far as the movement of the air is concerned.

To enable the movement of the air to be further controlled the flues G may be centrally divided by a partition g², and each half, the right hand, g³, half, or the left hand, g⁴, of the flue has its own connection G' with the flue H, and thus the air can be drawn evenly from both sides of the interior, a', or more from one side of the interior than from the other, as may be desired; and an additional feature is making those of the openings, g, which are farther from the center of the roof or ceiling larger than are those which are nearer the center, thereby to neutralize the tendency of the air currents to draw away from the sides of the interior a, and concentrate toward the center thereof.

The means for heating the interior, a', of the kiln are preferably as follows: J represents a pipe, provided with a suitable valve, j, for controlling the flow therein, which supplies steam, from any suitable source, to a system of heating pipes within the interior, and preferably as follows: The pipe J leads to a manifold, j¹, at one end of the interior, and at or near the floor, and from said manifold a series of pipes, j', lead over the floor to or toward the opposite end of the interior, there to connect with another manifold, j², and from this last named manifold a suitable connection, j³, leads to a steam trap, j⁴, all substantially as shown, and so as to provide for a steam-circulation throughout the interior of the kiln at or toward the lower part thereof. The pipes, j', preferably lead, more or less of them, directly in the vicinity of the air-inlets in the floor of the kiln, thereby to

facilitate the heating of the air current which enters the interior *a*. Any other equivalent means for supplying heat for the purpose named can be employed. Thus it will be seen
 5 provision is made for directing a controllable air current through the kiln so as to come into contact with the material or article to be dried, and also for controlling the temperature of the kiln, and also that the air-circulation
 10 and the heating can take place either simultaneously, or at different times; for by means of the valve *j* the delivery of the steam can be controlled as may be desired.

In Fig. 4 is shown a modified construction
 15 in respect to the mode of directing the air currents. In place of a vertical movement a horizontal one is employed. *K* represents one of a series of air-supply flues arranged at one side of the kiln, and having a series of inlets,
 20 *k*, leading into the kiln-interior, and at the opposite side of the kiln is another series of air-outlets, *l*, which lead into an air-outlet flue *L*. The flues *K*, *L*, can each be controlled by means of suitable dampers *k*, *l*, respectively, and the air can be drawn through the
 25 air-inlet flue into the kiln-interior and thence exhausted from the interior by means of any suitable air-moving device, not shown. *M* represents a system of piping arranged opposite the air inlets, in a manner analogous
 30 to that previously described in connection with the vertical air circulation, for the purpose of suitably heating the entering air-current whenever desired.

Although the apparatus herein described is
 35 well adapted for carrying out the improved method under consideration I desire not to be restricted thereto as other forms of drying apparatus may be employed for this purpose,
 40 and in the present application I do not desire to claim the apparatus herein described, but have of even date with this application made a

separate application for Letters Patent therefor, and whose serial number is 446,962.

I claim—

1. The hereinbefore described method of
 45 treating lumber, cooperage, and the like, in a drying receptacle, or chamber, the same consisting in passing a current of air through the chamber, continuing said current until the
 50 temperature and humidity in the chamber are substantially the same as of the entering air, and then subjecting the material to heat; substantially as described.

2. The hereinbefore described method of
 55 treating lumber, cooperage, and the like, in a drying receptacle, or chamber, the same consisting in passing a current of air through the chamber, continuing said current until the
 60 temperature and humidity in the chamber are substantially the same as of the entering air, and then subjecting the material to heat while continuing to pass the current of air; substantially as described.

3. The hereinbefore described method of
 65 treating lumber, cooperage, and the like, in a drying receptacle, or chamber, the same consisting in passing a current of air through the chamber, continuing said current until the
 70 temperature and humidity in the chamber are substantially the same as of the entering air, further continuing said current and gradually raising the temperature in the chamber by the application of heat to a point above that
 75 of the entering air, and finally arresting the current and subjecting the material to heat in the chamber; substantially as described.

Witness my hand this 19th day of September, 1892.

HORACE D. WILLIAMS.

Witnesses:

HORATIO D. WOOD,
 CHAS. D. MOODY.