

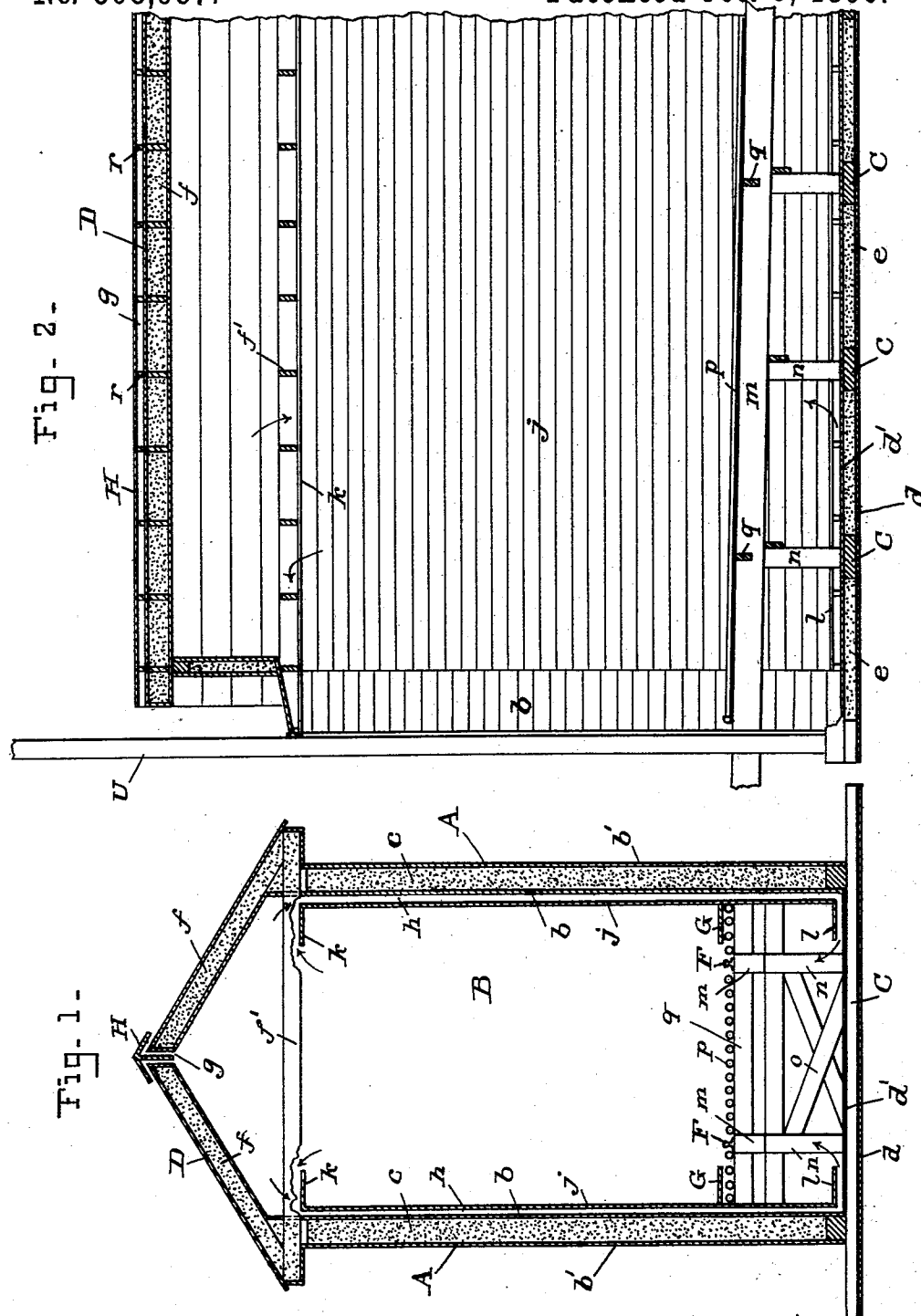
(No Model.)

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J. F. OLDFIELD.  
DRY KILN.

No. 568,987.

Patented Oct. 6, 1896.



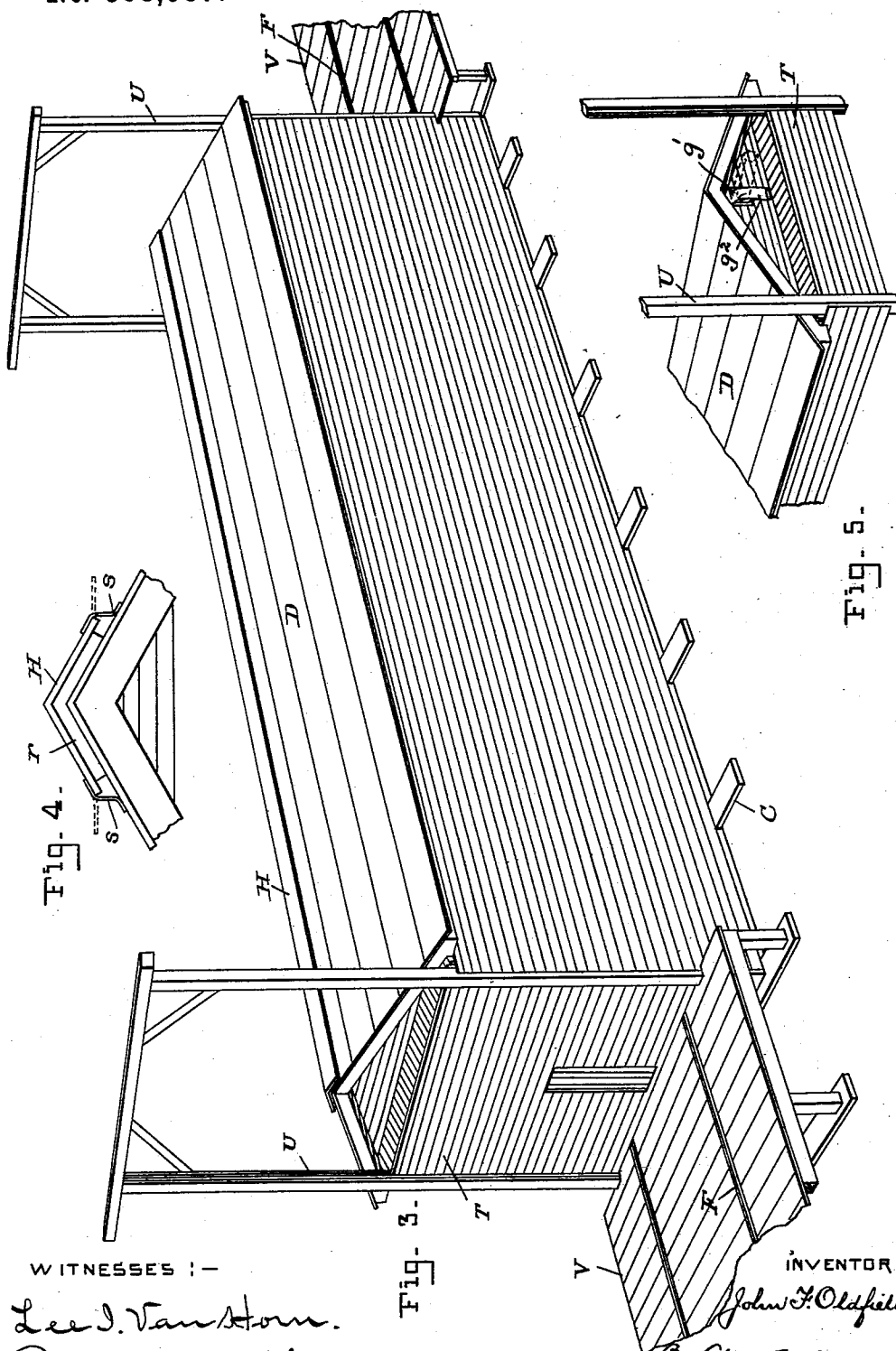
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WITNESSES :—

*Lee J. Van Horn.*  
*Charles B. Mann Jr.*

Fig-3-

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ATTORNEY.

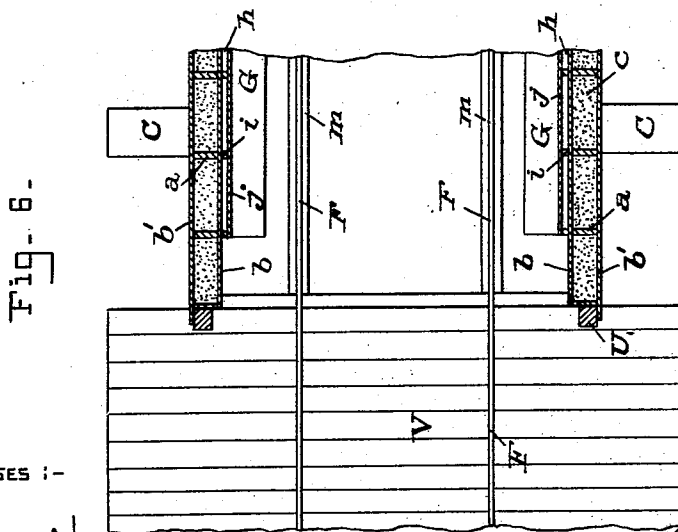
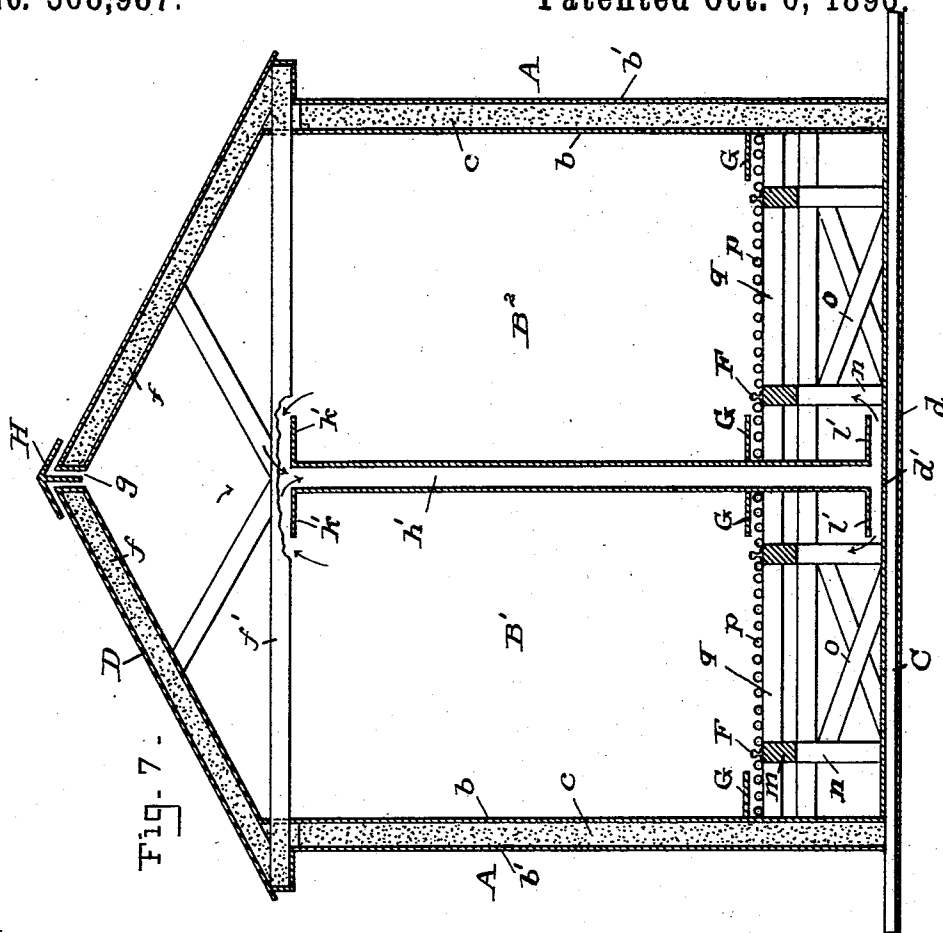
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# UNITED STATES PATENT OFFICE.

JOHN F. OLDFIELD, OF BALTIMORE, MARYLAND.

## DRY-KILN.

SPECIFICATION forming part of Letters Patent No. 568,987, dated October 6, 1896.

Application filed August 14, 1896. Serial No. 602,811. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN F. OLDFIELD, a citizen of the United States, residing at Baltimore, in the State of Maryland, have invented certain new and useful Improvements in Dry-Kilns, of which the following is a specification.

This invention relates to a drying-kiln of that class in which the material to be dried is placed upon trucks which are run into the kiln at one end. The drying then takes place, and the trucks are then run out of the kiln at the other end.

In order to make the invention more clearly understood, I have shown in the accompanying drawings certain means for carrying the same into practical effect.

Figure 1 is a vertical cross-section of my improved dry-kiln. Fig. 2 shows a vertical longitudinal section of part of the dry-kiln. Fig. 3 is a perspective view of the dry-kiln house. Fig. 4 is a detail view of the top opening for the outlet of moisture and flaps that close said opening. Fig. 5 is a perspective of part of the dry end of the kiln, showing a modification in the opening for the outlet of moisture. Fig. 6 is a horizontal or plan section of part of the dry-kiln. Fig. 7 is a vertical cross-section showing a modification of the improved kiln.

The process involved in operating this kiln may be briefly described as an automatic internal hot-humid-air-circulating process with a slight pressure prevailing in a drying-chamber, tightly closed everywhere except at the escapes for moisture, which are only sufficiently large for the average amount of moisture to be forced out, and are preferably placed at or near the top of the structure.

The house or kiln has exterior thick walls A, so constructed as to insulate the heat in the drying-chamber B from the external atmosphere. These walls may be made of brick, stone, or, as shown in the drawings, may be made of wood. Studs *a* are sheathed internally with boards *b* and externally with boards *b'*, and the space thus formed filled with some suitable material *c*, such as sawdust. The house structure rests upon cross-sills C, which are laid on a floor *d*, and upon the cross-sills is laid a tight floor *d'*, and between the two floors is a suitable filling *e* of sand or sawdust. The roof D is preferably

an ordinary double-inclined roof, the rafters having internal and external sheathing and a filling *f* of sawdust or other heat-insulating material. At the apex of the roof is an outlet or top opening *g* for the escape of the steam or moisture of evaporation. Cross-beams *f'* extend across the top of the walls and aid in sustaining the roof.

It is to be understood that the house structure just described has walls, bottom, and roof which are tight or without vents or openings of any kind for air or ventilation, except the outlet *g* at the top.

Within the structure I form down passages or ducts *h* (see Figs. 1, 2, and 6) against the walls A. Upright strips *i* are first secured against the walls and then sheathing *j* is attached to said strips, and thus the down-ducts *h* are formed. At the top these ducts have a horizontal flange or deflector *k*, which projects inward from the wall toward the center of the chamber, and at the bottom of the duct is a similar-shaped flange or board *l*, also projecting inward.

The track-rails F are supported on stringers *m*, resting on studs *n*, which are suitably stayed by braces *o*. The steam-pipes *p* or other means for heating by which the kiln is heated rest on cross-joists *q*, and these pipes are in the same or nearly the same horizontal plane as the track-rails. Just above the pipes at each side of the track is a deflector G, close against the sheathing *j* of the down-duct. This deflector-board serves to direct the heat rising up from the pipes laterally or away from the said sheathing, and thereby serves to protect the sheathing from the immediate effect of the intense heat just leaving the pipes. The moisture-outlet *g* at the top preferably extends along the edge of the roof, and on top of the roof, outside, is a saddle-shaped cover H, which rests on cross cleats or pieces *r*, which bridge across the said outlet. This cover keeps the rain from entering into the kiln and also serves for the attachment of flaps *s*, of cloth or other suitable flexible material. The said cloth flaps are shown in Fig. 4 and hang down over the opening *g* like a flap-valve and rest loosely on the roof for the purpose of retaining the moisture under any desired pressure.

At each end of the house is a door T, as

usual, which is raised and lowered by cords and weights arranged on the frame U in a well-known manner. The doors have a space between the sheathing at the sides which is filled with heat-insulating material. At each end is a platform V, whereon the track-rails F are laid.

The operation of this kiln is as follows: If it be assumed that the material to be dried is green lumber, the trucks (not shown) supporting the lumber will be directly over the steam-heating pipes *p* and the end doors closed. Steam will then be turned on to supply the pipes. The radiated heat of the pipes ascends through the lumber with a rapidity proportioned to the temperature of the pipes. The first ascent of the heated air is partially saturated with moisture taken from the lumber. The action of the heating-pipes at the closed bottom causes a suction at the lower end *l* of the down-ducts *h*, which produces a downward draft in said ducts, and thereby the heated partially-saturated air at the top is drawn downward through said ducts and discharged into the kiln again at the floor and below the heating-pipes. The same moist air then again passes up through the heating-pipes and is heated to a still higher degree, and then again ascends through the lumber and absorbs more moisture therefrom. This operation of the same hot moist air being reheated and passing up through the lumber, absorbing moisture, then passing down the ducts *h*, and having its temperature raised each time it comes in contact with the hot pipes is continuous, and the air becomes heated to the highest attainable temperature and saturated with moisture, creating a pressure in the drying-chamber. Then the hot moisture is forced from the chamber and passes out at the top opening *g* in the form of hot mist or steam. The temperature reached in the drying-chamber will exceed the boiling-point of water. A truck-load of green lumber will be subjected to this action of humid hot air for a period ranging from twenty-four to seventy-two hours, according to the thickness of the lumber, which very materially changes the time of process. At no time during this operation is fresh or cold air admitted to the kiln, except, it may be, when a fresh load of green lumber is entered at one end or a load of cured lumber taken out at the other end.

It will be understood that the arrangement of the outlet at the top, the tight bottom and sides, and the down-ducts in the kiln, the same being inclosed by heat-insulating walls, are such as to cause the ducts to avoid condensing or chilling and to keep the lumber in a hot humid atmosphere, in distinction to a hot dry atmosphere, which characterizes the condensing system of drying.

The modification shown in Fig. 5 relates to the top opening for the outlet of moisture. The outlet extending along the ridge of the roof is here dispensed with and an outlet *g'* made in the exit end or dry gable end, and a

cloth-flap tube *g*<sup>2</sup> is secured to surround said outlet. The hot mist or steam will find outlet through this cloth tube, which opens and closes automatically.

As ordinarily two or three trucks of lumber are in the drying-chamber at the same time—one truck at the exit or dry end being nearly cured, one truck in the middle partly dried, and one in the entrance or green end undergoing the first stages of drying—it may be best, for reasons due to the particular kind of lumber that is being dried, to compel all of the hot mist or steam to seek outlet at the dry end of the kiln instead of allowing it to escape at a ridge-opening; hence this modification.

The modification shown in Fig. 7 has the same tight walls, bottom, and roof and top opening, and heating-pipes in the bottom are the same; but the house structure is broader, and has at the center a longitudinal division which separates the interior into two drying-rooms B' B<sup>2</sup> instead of drying-room B, as shown in Fig. 1. The down-ducts *h* are formed in this central division and have at the top lateral deflectors *h'* and at the bottom flanges or inward-projecting boards *h''*. The operation is substantially the same as that already described for the form shown in Fig. 1. The only difference is that in circulating the hot moist air at the top must pass down the single central duct *h'* instead of down the two side ducts, as shown in the other form.

The operation of the kiln constructed as here shown and described demonstrates, first, that the continuous reheating of the same hot humid air enables a higher moist temperature to be attained than is possible in kilns which take in air at the bottom; second, that this continuous reheating process, under the stimulus of the heaters in the bottom and the moisture-sustaining flaps, creates a pressure in the drying-chamber which insures that the moist temperature will penetrate and be diffused between all the crevices of the lumber; third, that a uniformity of humidity is maintained in every part of the drying-chamber which fully protects the surface of all the lumber, both bottom and top, from the excessive heat until it is removed from the kiln.

It has been found in practice that lumber dried by this process retains its natural density, is soft on the surface, and comes from the kiln clean, bright, free from discolorations, checks, warps, and other imperfections that are usually found in kiln-dried lumber.

Having thus described my invention, what I claim is—

1. A dry-kiln structure having walls, bottom and roof filled or made heat-insulated and tightly closed without inlets, vents or other opening but provided at the top with an outlet to the atmosphere; a heater near the bottom but elevated above the bottom; and down passages or ducts within the structure and open at the top of the drying-chamber and also open at the bottom into the dry-

ing-chamber below the heater, whereby in operation the material to be dried is kept in a hot humid atmosphere and a downdraft will be produced in the said ducts and hot moist air in the top will pass down and be delivered under the heater without being condensed or chilled and then pass up through the heater where its temperature is increased and again through the material being dried, and finally hot mist or steam will be forced out of the said outlet at the top.

2. A dry-kiln structure having walls and bottom filled or made heat-insulated and tightly closed without inlets, vents or openings; a heat-insulated roof having an opening to the atmosphere extending longitudinally; an elevated cover over said opening but not closing it; and a flap of cloth or other flexible material secured to the cover, hanging down over the opening and resting on the roof.

3. A dry-kiln structure having walls, bottom and roof filled or made heat-insulated and tightly closed without inlets, vents or other opening but provided at the top with an outlet to the atmosphere; a cloth or other flexible flap covering said opening for the purpose

of retaining the moisture under pressure; a heater near the bottom but elevated above the bottom; and down passages or ducts within the structure and open at the top of the drying-chamber and also open at the bottom into the drying-chamber below the heater.

4. A dry-kiln structure having all external parts of the drying-chamber heat-insulated and tightly closed without inlets, vents or opening; in combination with a heater near the bottom but elevated above the bottom; vertical passages or down-ducts, *h*, beginning at the top of and adjoining the side insulated walls and extending down said walls below the heater; three horizontal flanges, one, *k*, at the top, another, *l*, at the bottom and a third, *G*, above the heater all projecting inward toward the center of the drying-chamber, substantially as shown and described.

In testimony whereof I affix my signature in the presence of two witnesses.

JOHN F. OLDFIELD.

Witnesses:

JAS. A. EDIE,

THOS. C. BAILEY.