

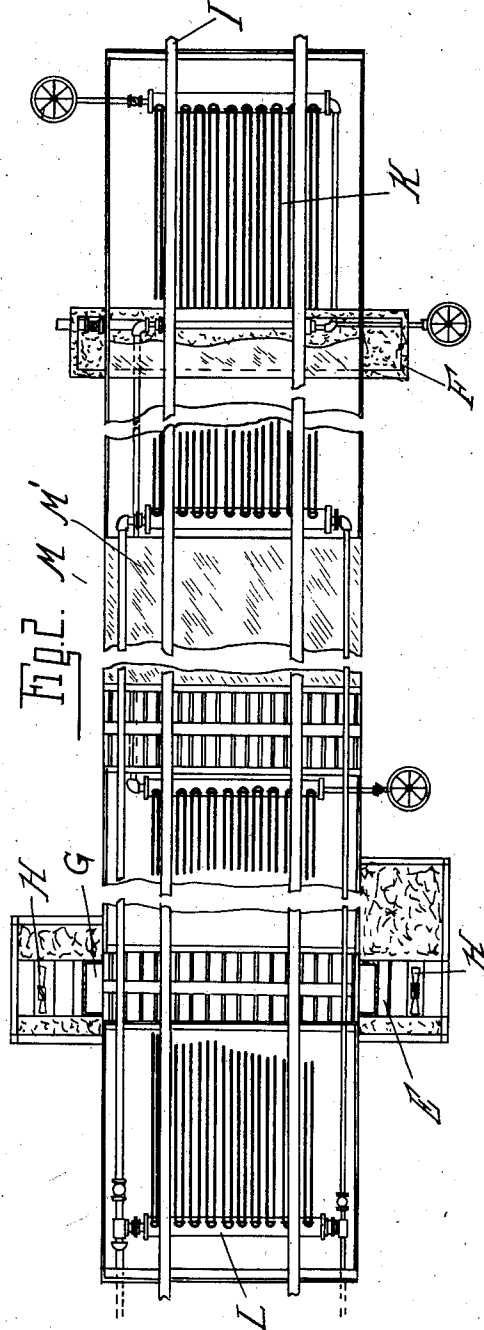
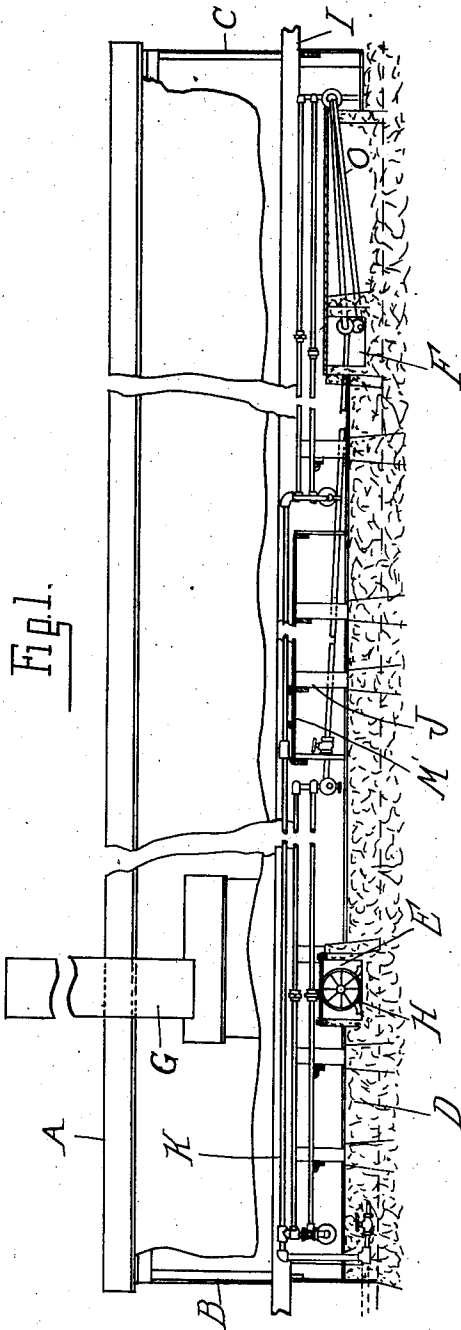
C. H. DINGMAN.
 DRY KILN.

APPLICATION FILED MAY 15, 1909.

Patented Dec. 20, 1910.

3 SHEETS—SHEET 1.

978,991.



Witnesses

W. E. Ford
 J. B. Belknap

By

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 Charles H. Dingman
 W. E. Ford
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C. H. DINGMAN.
 DRY KILN.

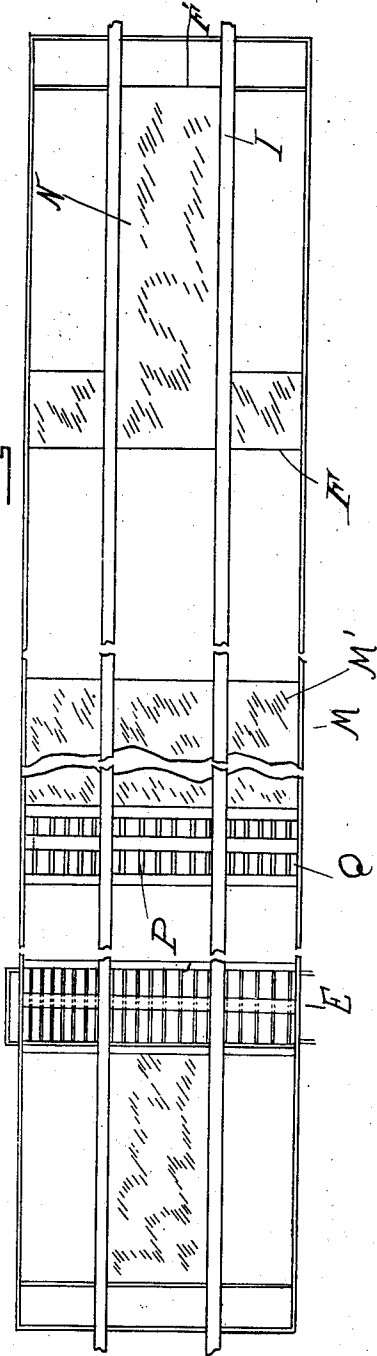
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3 SHEETS-SHEET 2.

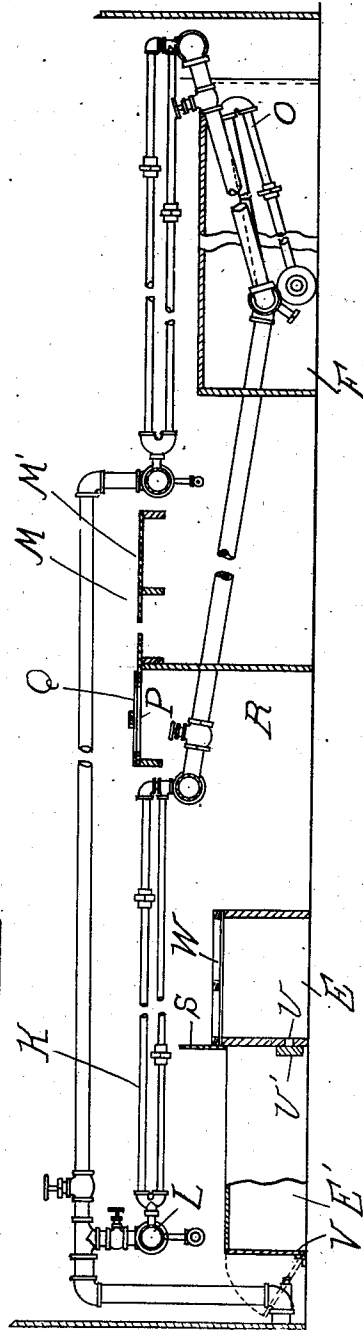
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Fig. 3.



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Fig. 4.



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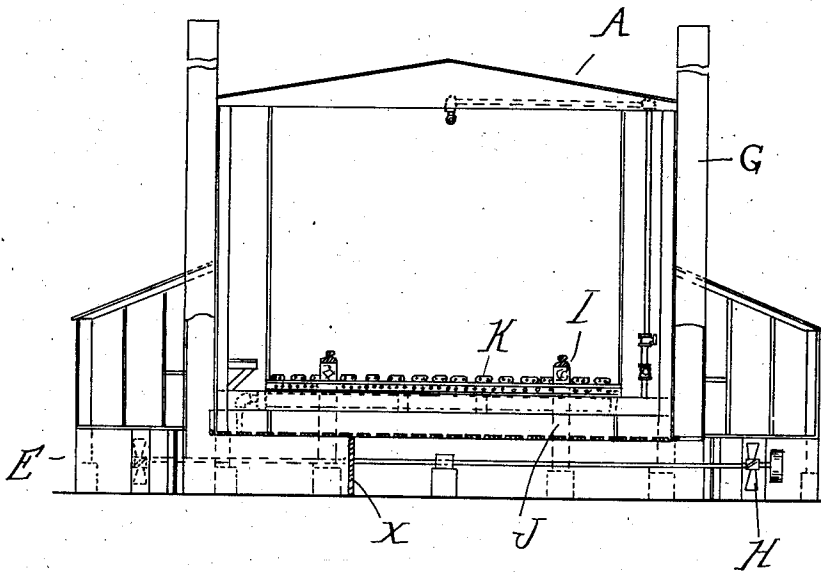
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3 SHEETS—SHEET 3.

Fig 5.



Witnesses

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UNITED STATES PATENT OFFICE.

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DRY-KILN.

978,991.

Specification of Letters Patent.

Patented Dec. 20, 1910.

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To all whom it may concern:

Be it known that I, CHARLES H. DINGMAN, a citizen of the United States of America, residing at Marion, in the county of Osceola and State of Michigan, have invented certain new and useful Improvements in Dry-Kilns, of which the following is a specification, reference being had therein to the accompanying drawings.

The invention relates to dry kilns particularly designed for use in drying lumber, and the invention consists in certain features of construction as hereinafter set forth.

In the drawings—Figure 1 is a sectional side elevation of the kiln; Fig. 2 is a sectional plan view thereof; Fig. 3 is a plan of a portion of the kiln below the plane of the radiators; Fig. 4 is a longitudinal section through Fig. 3; and Fig. 5 is a section in the plane of the outlet duct.

In the drying of lumber, it is important to complete the process in as short a time interval as possible. It is equally important to secure uniform drying and particularly that the center should be as thoroughly seasoned as the surface portions. With my improved construction I secure the desired results by subjecting the material as it is first fed into the kiln to a sweating process in an atmosphere laden with moisture from the lumber previously treated, and in then feeding the material slowly through the kiln and subjecting it to an atmosphere constantly decreasing in humidity, until finally it comes in contact with the dry heated air, which completes the process. The conditions just described are maintained in the kiln by the peculiar construction and arrangement of the heaters, and the means employed for forcing the circulation of the air as will be hereinafter described.

In detail, A is the building which is constructed to be as nearly air tight as possible, and is provided at opposite ends with removable doors or curtains B and C respectively permitting the insertion and withdrawal of the lumber. The walls of the building are preferably supported upon cement foundations D and at opposite points near the opposite ends of the kiln are arranged air flues E and F. These are preferably formed by cement walls extending across the kiln and a short distance beyond

the side walls thereof. One of the flues F is also provided with a central portion F' which extends longitudinally to near the end of the kiln. The other flue E preferably connects with external stacks G, and also has arranged therein fans H for forcing an air circulation.

For supporting the work, longitudinally extending track timbers I are arranged to extend the entire length of the kiln and are supported upon a series of posts or columns J.

K are heater coils arranged to extend longitudinally of the kiln, both inside and outside of the track timbers, which coils are connected to headers L at opposite ends thereof. The coils K extend from the opposite ends of the kiln for a portion of the length thereof, but are separated from each other by a central portion M in the kiln, in which there are no heaters. This central portion is covered with a flooring M', and there is also a flooring N covering the flue F and its extension F'. Beneath this flooring there are arranged heater coils O, which, together with the coils K at opposite ends of the kiln, are connected in one system, which may be supplied with either exhaust or live steam.

With the construction as thus far described, the temperature of the air within the kiln is maintained at the proper point by the heaters K, while the heater O serves to preheat the air entering the kiln through the flue F. This air is caused to enter said flue by the withdrawal of the air from the opposite end of the kiln through the flue in which, as previously stated, are arranged the fans H as well as the connection to the stacks G. Thus the inflow of the heated air may be accurately regulated by suitable adjustment in the operation of the fans.

The air entering through the flue F first comes in contact with the heaters O, between which it passes through the extension F' of the flue to the end of the kiln, and here passes upward across the entire end of the kiln. It will then be gradually drawn longitudinally through the kiln, until the point of communication with the flue E is reached, where it will pass into said flue and be expelled. The main point of communication with the flue E is through apertures P formed in the floor M', which are arranged across the kiln near one end of said floor,

and are adjustable in area by shutters Q. Through these apertures the air can pass downward beneath the radiator K and into the flue E, which is preferably provided
 5 with a grated covering for effecting more uniform distribution of the heat thereover. A partition R is arranged across the kiln below the flooring M' to cut off any longitudinal circulation beneath said floor, and
 10 there is also a deflector S beyond the flue E for interrupting any currents on the outer end of the kiln.

It will be understood from the description just given that the only means for causing
 15 a longitudinal movement of the air within the kiln is the withdrawal of the air through the flue E and a corresponding ingress of air through the flue F. This will cause a constant slow movement from the right
 20 hand end of the kiln toward the left, until the apertures P are reached, and then the movement will be downward through said apertures and beneath the heater K to the exit flue. Thus, above the heater there will
 25 be formed substantially a dead air space, in which there is very little longitudinal movement of air, although a slight circulation will be produced by the passage of the small portion of air downward between the coils
 30 of the heater R. The effect of this upon the drying of the lumber will be as follows: The green lumber is first placed in the kiln at the lefthand side and is permitted to remain for a certain length of time in the
 35 dead air space at that end of the kiln. Here the green lumber will be subjected to the heat of the radiator K, as well as the humid atmosphere laden with the moisture from the previously treated lumber so that a
 40 sweating treatment will be produced. This treatment continues as long as the lumber remains in the zone of the kiln between the lefthand end and the apertures P, but as it approaches the latter point there is a slight
 45 circulation of air due to the small portion that is withdrawn between the heater coils to the flue E. After passing beyond the apertures P the material is subjected to a slowly moving body of air, which becomes
 50 drier as the righthand end of the kiln is approached, and finally at the extreme righthand end the lumber is subjected to the preheated dry air directly entering to the flue F.

55 In addition to the longitudinal movement of air due to the operation of the fans H there is an up and down movement produced by the heating effect of the radiators K at the bottom of the kiln and the cooling due
 60 to absorption of the moisture and loss of heat through the sides and top of the building. This will result in a constant up and down circulation over the entire area above each of the radiators K, but over the central
 65 floor portion M of the kiln where there is no

radiators there will be merely a forward movement of air as a body. In this zone, the cooling of the air will cause it to stratify the heavy moisture laden portions, finally passing downward through the apertures P,
 70 and being expelled from the kiln. Thus by suitably regulating the fans H the most favorable conditions of humidity may be maintained in the various portions of the kiln but produce the gradual drying and
 75 the seasoning of the center as well as the surface portions.

A variation in the length of the dead air space may be effected by adjusting the shutters Q to limit the area of the apertures P.
 80 This will restrict the air circulating through said apertures, and will compel the movement of the air body farther forward and downward between the coils of the radiator K, but the effect will not extend forward of
 85 the flue E, as the deflector S will interrupt movement of the air from this portion. I would, however, preferably provide ventilator openings U in the forward side of the outlet duct E, and by suitably adjusting
 90 dampers U', controlling these apertures, a small quantity of air is permitted to pass therethrough, this being withdrawn from the dead end of the kiln.

For certain kinds of lumber, the dead air
 95 space, or sweat box, is not necessary, and the space can be utilized to advantage as a part of the circulating system. I have therefore provided means for converting my kiln into one in which the air is compelled to
 100 travel throughout the entire length, being drawn off at the lumber entrance end. As shown, E' is an extension of the flue E, similar to the extension F' of the flue F, but the outer end of this extension—instead of
 105 remaining open—is closed by a door V. Thus, under ordinary conditions, where the door V is closed, the kiln operates as has been above described, but where the door V is open then the air will be drawn from the
 110 extreme end of the kiln, which will cause the continuous movement of the body of air within the kiln toward that end. The flue E is provided at the top with an adjustable member W, which permits of closing the
 115 apertures when the circulation is desired throughout the entire length of the kiln.

As has been described, the kiln is provided with both a stack connection G and the exhaust fan H. Economy can be ef-
 120 fected by using the stack for a portion of the flue E—as, for instance, one-third of its length—while the remaining portion is connected with the fan. Thus by placing a
 125 partition X across the flue E the work will be divided between the stack and fan.

What I claim as my invention is:

1. A dry kiln comprising a housing, through which the material to be dried is
 130 fed from one end to the other, means for

heating the air within said housing in the end portions thereof with an intermediate zone unprovided with heating means, means for causing a movement of the air bodily through the housing from the exit end toward the inlet to a point at the forward end of said unheated zone, and for there discharging the moisture-laden air from the housing.

2. A dry kiln comprising a housing through which the lumber to be dried is fed from one end to the other, cross flues arranged at the base of said housing near the opposite ends thereof, said flues communicating with the external atmosphere, a flue leading from one of said cross flues to the exit end of the housing a heater in said flue and a fan in the other flue for withdrawing the air therefrom.

3. A dry kiln comprising a housing through which the lumber to be dried is fed from one end to the other, means for maintaining a heated zone within said housing at opposite ends thereof with an intermediate zone therebetween unprovided with heating means, and means for causing the forward movement of the air from the exit end of the housing from the heated zone adjacent the exit end and the unheated zone, and for maintaining a substantial dead air space over the zone adjacent the inlet end.

4. A dry kiln comprising a housing through which the lumber to be dried is fed from one end to the other, heaters arranged at the base of said housing, at opposite ends thereof, and intermediate floored zones unprovided with heating means, air flues extending across the base of said housing at opposite ends thereof, a flue connecting with one of said air flues and extending to the exit end of said housing, a preheater for the air within the last-mentioned flue, means for causing the withdrawal of the air from the opposite flue.

5. A dry kiln comprising a housing through which the material to be dried is fed from one end to the other, means for heating the air within said housing, an inlet air flue communicating with the exit end of said kiln, an exit air flue at the opposite end of said kiln, a fan for drawing out the air through said exit flue, and a stack operating as an auxiliary to said fan for drawing out the air.

6. A dry kiln, comprising a housing through which the material to be dried is fed from one end to the other, means for heating the air within said housing in the end portions thereof, with an intermediate zone unprovided with heating means, an outlet duct for the air in communication with this unheated zone, and an auxiliary outlet in the heated zone of the inlet end.

7. A dry kiln, comprising a housing through which the lumber to be dried is fed

from one end to the other, means for heating the air within said housing, means for admitting air at the exit end of the housing, and means for preheating the air as it is admitted to the housing, means for discharging the moisture-laden air at a point intermediate said air inlet and the lumber inlet, and means for maintaining a dead air zone at the inlet end of said housing.

8. A dry kiln, comprising a housing through which the lumber to be dried is fed from one end to the other, means for heating the air within the housing, an air flue for admitting air to the exit end of the housing, means within said flue for preheating the air before it is admitted to the housing, and means for discharging moisture-laden air at a point intermediate said air inlet and the lumber inlet, and means for maintaining a dead air zone at the inlet end of said housing.

9. A dry kiln, comprising a housing through which the lumber to be dried is fed from one end to the other, heaters arranged across the lower portion of said housing at opposite ends thereof, an air flue at the exit end of the housing forming the sole means for admitting the air to the latter, a second air flue for maintaining air at a point intermediate the exit and inlet ends of said housing, positive means for forcing the air circulation, and means for maintaining a dead air zone at the inlet end of said housing.

10. A dry kiln comprising a housing through which the material to be dried is fed from one end to the other, a flue at one end of said housing, an air heater in said flue, means for heating the air at opposite ends of the housing with an intermediate zone unprovided with heating means, means for causing a movement of the air bodily through the housing from the exit end toward the inlet to a point at the forward end of the unheated zone and for there discharging the moisture laden air from the housing.

11. A dry kiln comprising a housing through which the material to be dried is fed from one end to the other, a flue at one end of the housing, a cross flue connected therewith, a heater in said first mentioned flue a second cross flue at the opposite end of the housing, means for heating the air at opposite ends of the housing, and means co-operating with said flue for maintaining a dead air zone therein at the inlet end of the housing.

12. A dry kiln comprising a housing through which the material to be dried is fed from one end to the other, a flue at one end of the housing, a cross flue connected therewith, a heater in said first mentioned flue, a second cross flue adjacent the opposite end of the housing, spaced heaters arranged at opposite ends of the housing forming a

zone intermediate said heaters unprovided with heating means, a flooring for said zone having valve controlled apertures therein, and means cooperating with said
5 flues for maintaining a dead air zone at the inlet end of the housing.

13. A dry kiln comprising a housing through which the material to be dried is fed from one end to the other, a flue at one
10 end of the housing, a cross flue connected therewith, a second cross flue adjacent the opposite end of the housing, spaced heaters arranged at opposite ends of the housing, forming a zone between said heaters unpro-
15 vided with heating means, a flooring for said zone having valve controlled apertures, valves controlling apertures in the second flue, and a deflector positioned adjacent the last mentioned apertures.

14. A dry kiln comprising a housing 20 through which the material to be dried is fed from one end to the other, means for heating the air in said housing, an inlet flue for admitting air to the exit end of said kiln, means for causing the bodily movement of
25 air through said kiln alternatively through a portion or the entire length thereof, said means comprising an exit flue arranged intermediate the ends of the kiln, an extension of said exit flue to the inlet end of the kiln, 30 and means for opening or closing said extension.

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

CHAS. H. DINGMAN.

Witnesses:

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W. J. BELKNAP.