E. D. SIDMAN.

LUMBER CURING KILN.

APPLICATION FILED DEC. 14, 1917.

1,276,979.

Patented Aug. 27, 1918.

3 SHEETS—SHEET 1.

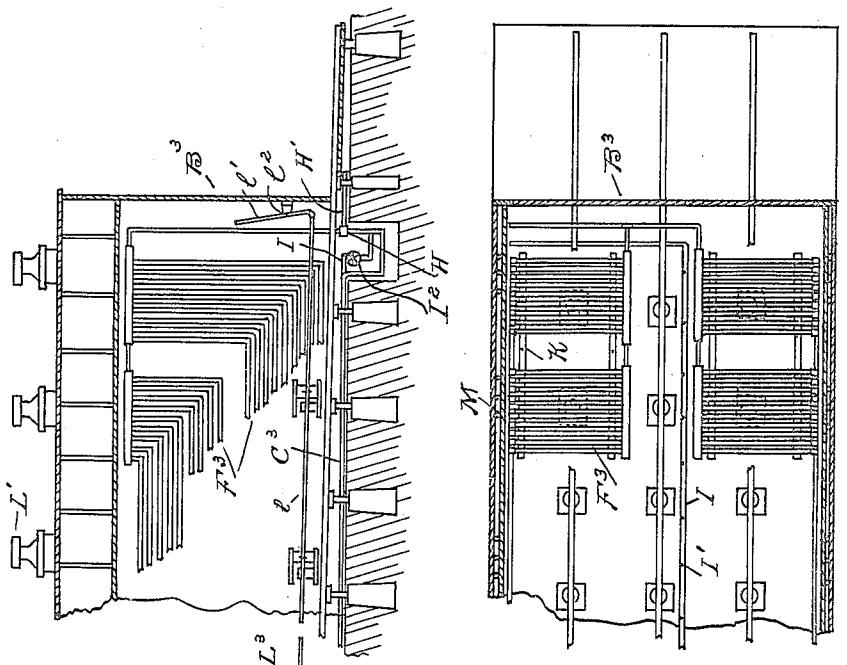


Fig. 1.

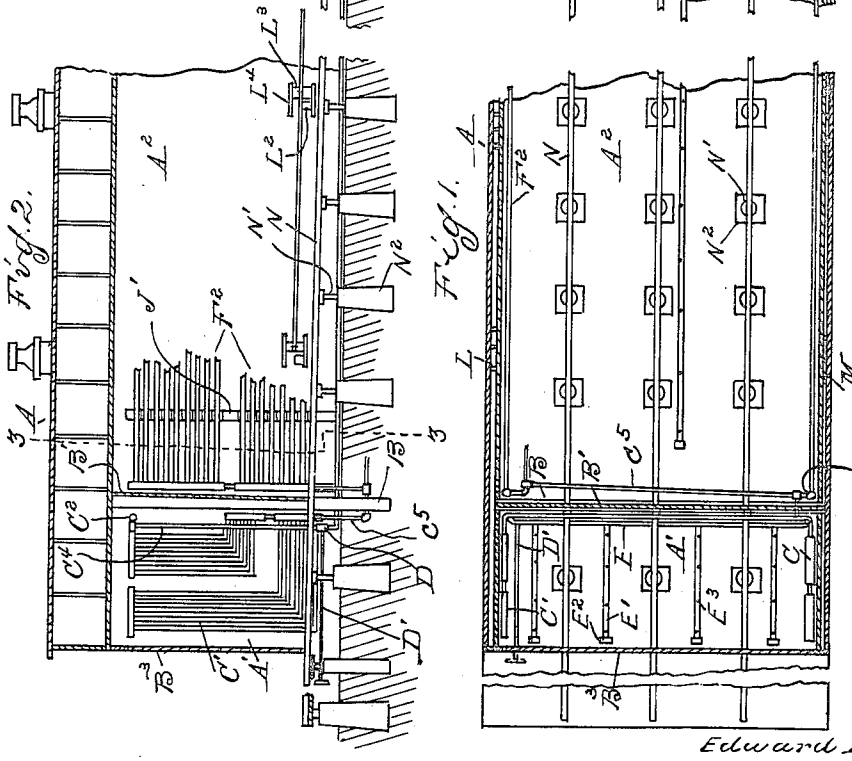


Fig. 2.

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3 SHEETS—SHEET 2.

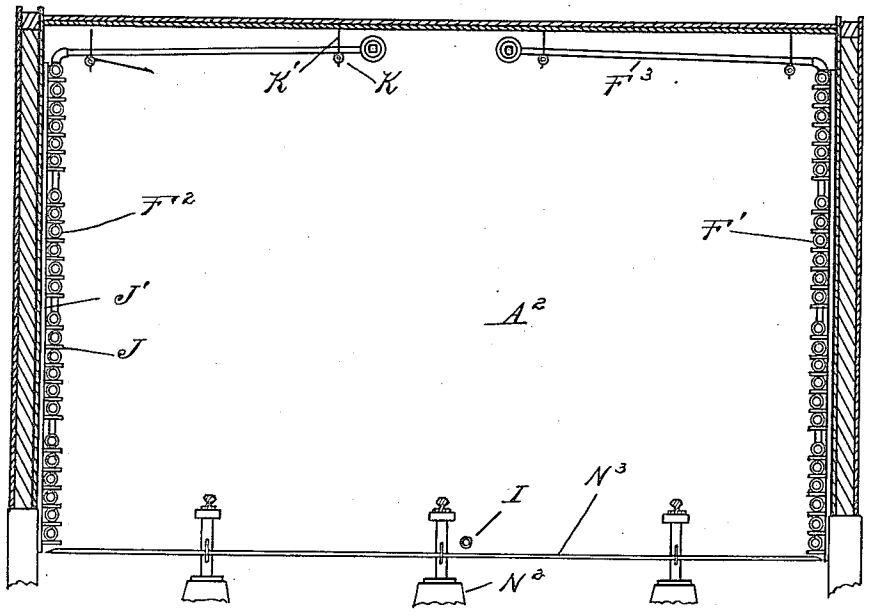
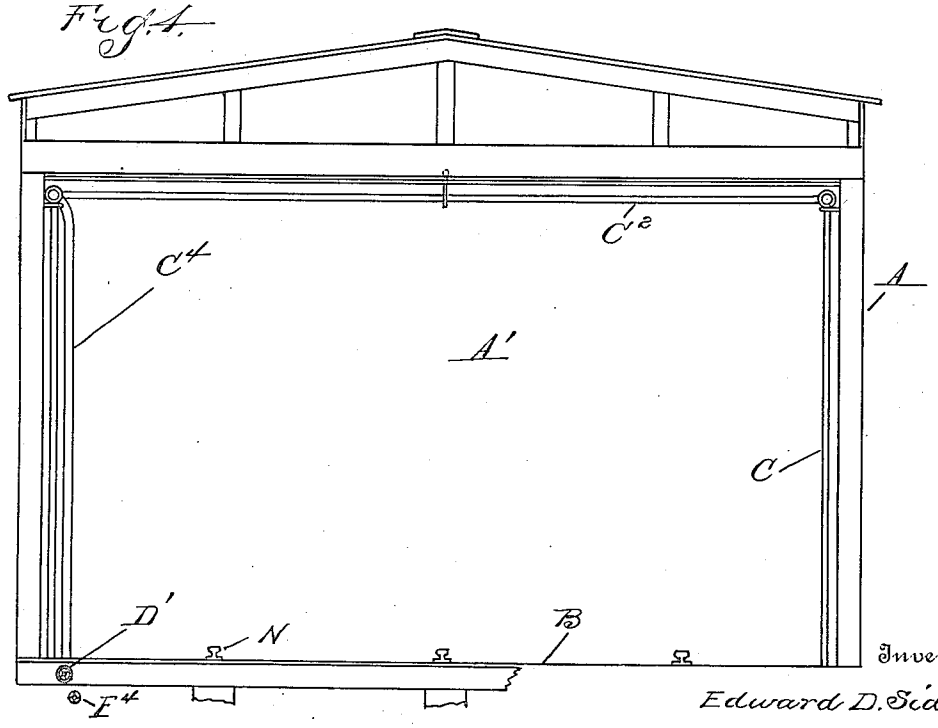


Fig. 3.

Fig. 4.



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3 SHEETS—SHEET 3.

Fig. 5.

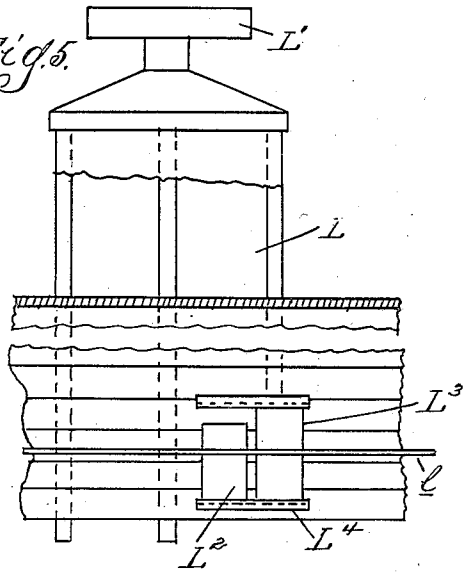


Fig. 6.

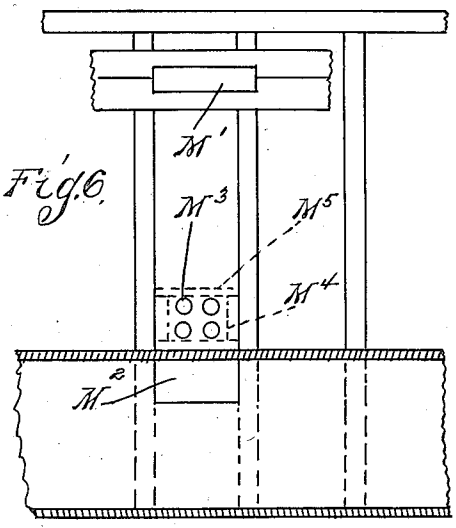


Fig. 7.

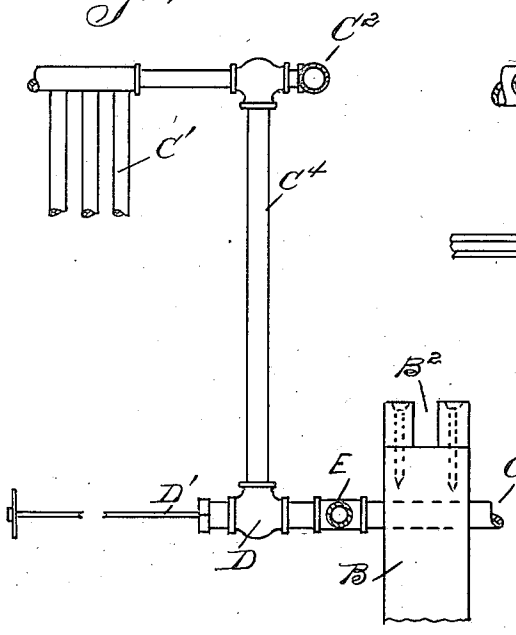
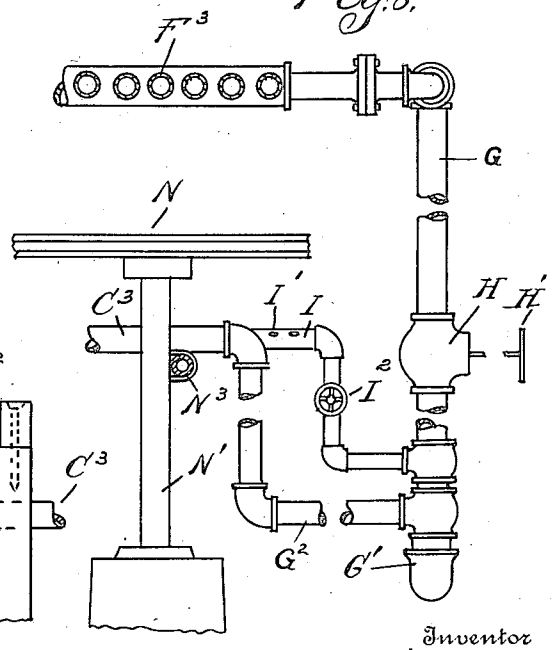


Fig. 8.



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EDWARD D. SIDMAN, OF LONDON, ONTARIO, CANADA.

LUMBER-CURING KILN.

1,276,979. Specification of Letters Patent. Patented Aug. 27, 1918.

Application filed December 14, 1917. Serial No. 207,034.

To all whom it may concern:

Be it known that I, EDWARD D. SIDMAN, a citizen of the United States of America, residing at London, in the Province of Ontario and Dominion of Canada, have invented certain new and useful Improvements in Lumber-Curing Kilns, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates to kilns for curing or drying lumber, and the object of the invention is to secure a construction which insures an automatic circulation of air within the kiln, which concentrates the heat at the unloading end of the kiln, and which progressively decreases the humidity of the air within the kiln. Another object of the invention is to secure a construction which requires no excavation or pit below the ground line of the kiln, which may be constructed at a marked saving in first cost and which also operates at a noticeable saving in cost. Still another object of the invention is to obtain a construction in which the expansion is properly taken care of without the objectionable breaking of the fittings, in which better circulation of the heating medium is obtained, in which less pipe is required to raise the temperature to the desired degree, and in which no heavy expensive headers or expansion pipes are necessary. Further objects of the invention will more fully hereinafter appear.

In the drawings,—

Figure 1 is a plan view, with the roof removed, of a kiln embodying my invention;

Fig. 2 is a sectional side elevation thereof;

Fig. 3 is a sectional view on the line 3—3 of Fig. 2;

Fig. 4 is a sectional end elevation;

Figs. 5 and 6 are details of the foul air and cold air flues, respectively; and

Figs. 7 and 8 are details of the pipe connections respectively in the tempering and finishing compartments.

A represents the kiln, provided with the tempering room or compartment A′ and the finishing room or compartment A^2, which rooms or compartments are separated by the bridge wall B and the rolling curtain B′ fitting within the channel B^2. The kiln is provided with the doors B^3 at opposite ends thereof, or the loading and unloading ends.

The tempering room or compartment A′ is provided with the miter heat radiating pipes or coils C and C′ on the opposite side walls thereof, connected by the pipe C^2 located adjacent to the ceiling of the kiln. The supply pipe C^3 leading from a heating medium source, preferably steam, at the low pressure of from 2 to 5 pounds (not shown) connects with the riser C^4 leading to the pipes or coils C′ and the return pipe C^5 leading preferably to a suction system (not shown) connects with the pipes or coils C. To control the admission of the heating medium to the heat-radiating pipes or coils, the valve D is provided near the lower end of the riser C^4, the valve having the stem D′ of a length to extend outside of the tempering room or compartment so that the same may be easily operated. Connecting into the supply pipe C^3 is the transversely-extending pipe E, adapted to lie beneath the car carrying the lumber and having the parallel spray pipes E′ provided with the caps E^2 on their ends and the spaced apertures E^3 drilled in their upper portions. The valve E^4 controls the admission of the spray, and its operating stem is arranged to be operable from outside the kiln. Preferably the connection between the spray pipes E′ and the pipe E, such as the swinging joint connection, is such that the spray pipes are adjustable in position to suit the varying conditions.

The finishing room or compartment A^2 is provided with the combined miter wall and ceiling heat radiating pipes or coils F, comprising the opposite side wall horizontally-extending pipes or coils F′ and F^2 and the ceiling pipes or coils F^3 extending transversely of the kiln roof and from near the center thereof to near the side walls and then dropping down to connect with the wall pipes or coils. The ceiling pipes or coils are located at the unloading end of the finishing room or compartment to concentrate the heat at this point. The supply pipe G leading preferably from the same heating medium source for the tempering room or compartment pipes or coils is connected with the wall pipes or coils F^2 by the swing L G′ and the return-pipe G^2 preferably leading to the same suction system for the tempering room or compartment pipes or coils is connected with the wall pipes or coils F′ by another swing L G^3. To control the admission of the heating medium to the combined miter wall the ceiling heat-radiating

pipes or coils, the valve H is provided with its stem H′ extending outside of the room or compartment. Connected in a suitable manner to the heat-radiating pipes or coils is the spray pipe I adapted to lie beneath the cars carrying the lumber and extending substantially centrally and longitudinally of the finishing room or compartment and for nearly its total length, said pipe having the spray apertures I′ in its upper portion. A suitable valve I^2 operable from outside the room or compartment controls the admission of the spray.

The wall heat radiating pipes or coils F′ and F^2 extend substantially horizontally and rest on hook plates J secured to the strips J′ upon the side walls, the arrangement being such that the pipes or coils are held a substantial distance from the side walls of the kiln to secure a good circulation of air thereabout. The ceiling heat-radiating pipes or coils F^3 rest upon the supports K extending longitudinally of the finishing room or compartment, in turn held in position by means of the lag-screw hangers K′ secured in the joists forming part of the kiln roof. The ceiling and wall pipes or coils are arranged preferably so that they slope gradually from the center of the kiln down to the sides thereof and then lengthwise to the return-pipe.

For the purpose of ventilation in the finishing room or compartment a series of foul air flues L in one of the side walls and a series of cold air flues M in the other of the side walls are employed. The foul air flues start at or near the ground line of the kiln and extend above the highest point of the roof preferably one or more feet, said flues being capped or surmounted by the vent head L′ for positively preventing a down draft being created in the flues. Each foul air flue is provided with the vertical opening L^2 therein approximately level with the bottom line of the lumber piled on the standard car, the bottom of the opening being approximately eight inches above the rails carrying the cars, to be described presently. The openings L^2 are controlled by sliding dampers L^3, preferably of the same size and formed of copper, these being dampers adapted to slide in groved guides L^4 secured to the side walls of the room or compartment. These sliding dampers are connected to the rod *l* extending longitudinally of the finishing room or compartment and secured at one end to the lever *l′* pivoted at l^2, at the unloading end of the kiln, the lever *l′* being arranged to be easily reached by the arm of the operator from outside the kiln.

To automatically graduate the amount of humidity removed from the kiln from a minimum near the bridge wall to a maximum near the unloading end as the lumber progresses through the finishing room or compartment, the foul air openings L^2 are gradually increased in size from the opening nearest to the bridge wall to the opening nearest to the unloading end.

The cold air flues M start at or near the ground line of the kiln and extend to the ceiling line where they are tightly blocked off. Each of these flues is respectively provided adjacent to the ceiling and adjacent to the ground line with the horizontal openings M′ and M^2, the size of the respective openings remaining substantially constant. To assist the foul air flues to properly operate and to avoid the tendency of the heated air to escape through the cold air openings, the cold air flues are constructed to maintain a leg of cold air near the bottom of the flues by connecting with the outside air when in operation, the connections being controlled by an air-tight damper (not shown), and by being heated by the side wall heat-radiating pipes or coils F′ and F^2. This, with the natural suction produced by the foul air flues, prevents the current of air in the cold air flues from reversing. Another method of maintaining a leg of cold air is to provide the cold air flues with the tapped openings M^3 outside of the kiln at any point from the ground line up to one third approximately of the length of the flue below the ceiling, the openings being controlled by the dampers M^4 sliding in the guides M^5.

Due to the construction as thus far described, it will be seen that the circulation of air within the kiln is produced by the upward draft in the foul air flues and that this draft is not induced by auxiliary means within the flues but by the arrangement of the flues in the side walls and the wall heat-radiating pipes adjacent thereto. The maintaining of the leg of cold air in the cold air flues further assists in the proper circulation. Better circulation is also obtained by having the foul air flue opening into the kiln at approximately the level of the lower surface of the lumber to be cured or dried. Further, the amount of heat-radiating pipes or coils is materially reduced.

To secure the best results, the combined area of the foul air flue openings into the kiln is such that with the velocity of air at approximately 210 feet per minute a complete change of the kiln atmosphere takes place every hour. Air should also enter the cold air flues at approximately the same rate of velocity.

The rails N are employed for carrying the lumber-carrying cars and have a pitch of approximately 1″ to 10′ from the loading to the unloading ends of the kiln. The rails are secured to the iron pipe and track supports N′, the bottom flanges of which are fastened to the tops of the piers N^2, preferably formed of cement. Cross supporting

pipes N³ properly secured to the pipe and track supports brace the same to make a substantial underwork.

In operation, assuming that the lumber to be cured or dried is 2″ oak, which has been air-dried at least four months, the car carrying the same properly piled is pushed into the tempering room and the doors at the loading end and the rolling curtain are closed. The valve on the spray pipe is opened from one to five minutes or until a thick gray fog or vapor inside the room or compartment is obtained, when the valve is closed until it admits just enough steam so that the heat from the spray alone will raise the temperature to 120° F. in not less than twelve hours. When this point is reached the valve controlling the heat-radiating pipes or coils is opened wide to obtain a temperature of 165° F. to 175° F., care being taken to maintain the relative per cent. of humidity. For this purpose a hygrometer is used in which the wet and dry bulbs should read the same, and in no case should there be allowed a difference of over 5°. This condition is maintained twenty-four hours from the time spray is first turned on, and then the lumber is ready to push into the finishing room or compartment, when the tempering room or compartment may be used again.

The car is then pushed into the finishing room or compartment just far enough to clear the curtain, and then the curtain is closed, as are also the doors at the unloading end and all the dampers to the ventilating system. The steam to the heat-radiating pipes or coils is turned on full, and when the temperature in the finishing room or compartment reached 100° F., or over, the foul air flue dampers are partly opened. In thirty minutes or so, if the heat in the room or compartment continues to rise, the foul air flue dampers are opened wide and approximately thirty minutes after this the cold air flue dampers are opened. The temperature within the finishing room or compartment is allowed to rise to 165° F. to 175° F., which is approximately the high limit with the present radiation and steam pressure, and when this point is reached the valve on the spray pipe is opened to admit the spray until the wet bulb on the hygrometer shows from 25° to 30° lower than the dry bulb. Usually after the finishing room or compartment is filled with lumber the moisture absorbed in the tempering operation with the moisture normally contained in the lumber will maintain the required relative per cent. of humidity in the finishing room or compartment; but if the required per cent, is not present the spray pipe valve is opened until the required per cent. is obtained. The above conditions are maintained and as each car of lumber is tempered it is pushed into the finishing room or compartment. When ten cars have been tempered the first car is cured or dried, if the operations have been carefully followed out.

Although I have shown my invention as applied to a multiple compartment or progressive kiln, it is to be understood that the same may be successfully applied to a single compartment or box kiln.

What I claim as my invention is:—

1. In a kiln for drying lumber, the combination with a room or compartment, of combined miter wall and ceiling heat-radiating pipes or coils for heating the interior thereof.

2. In a kiln for drying lumber, the combination with a room or compartment, of combined wall and ceiling heat-radiating pipes or coils for heating the interior thereof, and a spray pipe adapted to lie below the lumber to be cured or dried.

3. In a kiln for drying lumber, the combination with combined wall and ceiling heat-radiating pipes or coils for heating the interior of the kiln, of a spray pipe adapted to lie below the lumber to be cured or dried, and valves controlling said pipes or coils and spray pipe, operable from outside the kiln.

4. In a kiln for drying lumber, the combination with combined wall and ceiling heat-radiating pipes or coils for heating the interior of the kiln, of a spray pipe adjustably connected with said pipes or coils, and control means for said pipes or coils and spray pipe, operable from outside the kiln.

5. In a kiln for drying lumber, the combination with a series of wall heat-radiating pipes or coils, of a series of ceiling heat-radiating pipes or coils, one of said series being located adjacent to one end of the kiln, the other series extending substantially the entire length thereof.

6. In a kiln for drying lumber, the combination with wall heating radiating pipes or coils extending substantially the length of the kiln, of ceiling heat-radiating pipes or coils located adjacent to one end of the kiln.

7. In a kiln for drying lumber, the combination with wall heat-radiating pipes or coils, of ceiling heat-radiating pipes or coils, the greater proportion of the pipes or coils being located adjacent to the unloading end of the kiln.

8. In a kiln for drying lumber, the combination with a foul air flue in a wall thereof, of wall heat-radiating pipes or coils adjacent to said wall for heating the interior of the kiln and inducing a draft in said flue, a portion of said radiating pipes or coils being above the opening from the kiln into said foul air flue.

9. In a kiln for drying lumber, the combi-

nation with a foul air flue in a side wall thereof, provided with an opening into the kiln substantially level with the lower side of the lumber being cured or dried, and heat-radiating means within the kiln for heating the interior thereof and inducing a draft in said flue.

10. In a kiln for drying lumber, the combination with a room or compartment, of a series of foul air flues in one of the side walls thereof, and means for automatically varying the amount of humidity removed from the room or compartment from a minimum near one end to a maximum near the opposite end.

11. In a kiln for drying lumber, the combination with a room or compartment, of a series of foul air flues in one of the side walls thereof, provided with openings into said room or compartment of gradually increasing size from near one end thereof to the opposite end.

12. In a kiln for drying lumber, a room or compartment, heating means for the interior thereof, arranged to give greater heat adjacent to one end thereof, and means for automatically varying the amount of humidity removed from said room or compartment from a maximum at the end where the heating means is concentrated to a minimum at the opposite end.

13. In a kiln, the combination with a series of foul air flues in one of the side walls thereof having openings into said kiln of varying size, of a series of cold air flues in the opposite side wall, wall heat-radiating pipes or coils upon the side walls, and means for maintaining a column of cold air in said cold air flues near the bottom thereof.

14. In a kiln, a room or compartment, a cold air flue in one of the side walls of said room or compartment, and means for maintaining a column of cold air in said flue near the bottom thereof.

15. In a kiln, the combination with a tempering room having wall heat-radiating pipes or coils and a spray pipe, and valves controlling said pipes or coils and spray pipe from without said room, of a finishing room, having combined wall and ceiling heat-radiating pipes or coils and a spray pipe, and valves controlling said last-mentioned pipes or coils and spray pipe, operable from without the finishing room.

16. In a kiln, for drying lumber, a room or compartment, wall-heating radiating pipes or coils upon the side walls thereof, a supply pipe, a return pipe, and swinging L's connecting said pipes or coils to said supply and return pipes to allow of expansion thereof.

17. In a kiln for drying lumber, combined ceiling and miter wall heat-radiating pipes or coils for heating the interior of the kiln and the lumber contained therein, a perforated spray pipe for admitting moisture to the atmosphere within the kiln, and an air flue extending from near the ground line of the kiln to a point above the highest point of the roof, and a non-down draft vent head capping or surmounting said flue.

18. In a kiln for drying lumber, the combination with heat-radiating pipes or coils for heating the interior of the kiln and the lumber contained therein, of a perforated spray pipe for admitting moisture to the kiln atmosphere, and a series of foul air flues in one of the side walls of the kiln, each flue being provided with an opening into the kiln and the combined area of the openings being such that with a velocity of air at approximately 210 feet per minute a complete change of the kiln atmosphere very hour will be made.

19. In a kiln for drying lumber, the combination with a series of foul air flues in a side wall thereof, each provided with an opening into the kiln substantially level with the lower line of the lumber being cured or dried, dampers for covering said openings, a rod secured to said dampers, a lever adjacent to one end of the kiln and connected pivotally to said rod, and a common means for heating the interior of said kiln and inducing an up-draft in said flues.

20. The process of curing or drying lumber, comprising the tempering of the lumber by successively spraying the same until a thick gray fog or vapor is obtained, raising the temperature by the spraying to approximately 120° F., raising the temperature by heating to from 165° to 175° F., and maintaining meanwhile the same relative degree of humidity, and the finishing of the lumber by successively raising the temperature to 100° F., or over, opening the foul air and cold air flues as the temperature raises to finally reach from 165° to 175° F., admitting moisture until the hygrometer wet bulb shows from 25° to 30° lower than the hygrometer dry bulb, maintaining these temperatures and gradually decreasing the humidity.

21. The process of curing or drying lumber, comprising the placing of the lumber in a tempering room in which the same is successively subjected to moisture for saturating and slightly heating the same and to greater heat, and the placing of the lumber in a finishing room in which the same is successively subjected to greater heat and progressive decrease of the humidity of the atmosphere relative to the unloading end of the kiln, the temperature remaining substantially constant.

22. The process of curing or drying lumber, comprising the placing of the same in a tempering room, the subjecting successively thereof to moisture from therebeneath to heat from near the sides thereof,

and the placing of the lumber into the finishing room, and the subjecting thereof to heat from near the sides and top thereof.

23. The process of curing or drying lumber, comprising the placing of the same into the tempering room, and the successive subjection thereof from therebeneath to moisture for saturating and slightly heating the same, and to greater heat from near the sides thereof, and the placing of the lumber into the finishing room, and the successive subjection thereof to greater heat from near the sides and top thereof, and to gradual decrease of the humidity while maintaining substantially the same temperature.

24. The process of curing or drying lumber, comprising the placing of the lumber in the tempering room, and successively subjecting the same to saturation and low heat from therebeneath and greater heat from near the sides thereof, and the placing of the lumber in the finishing room, and the successive subjecting of the same to greater heat from near the sides thereof to concentrated greater heat from near both the sides and top thereof, and meanwhile to the gradual decrease of the humidity in the kiln atmosphere.

In testimony whereof I affix my signature.

EDWARD D. SIDMAN.