Sept. 22, 1936. A. W. FERRE 2,055,073

DRYING APPARATUS

Filed March 23, 1935 2 Sheets-Sheet 1

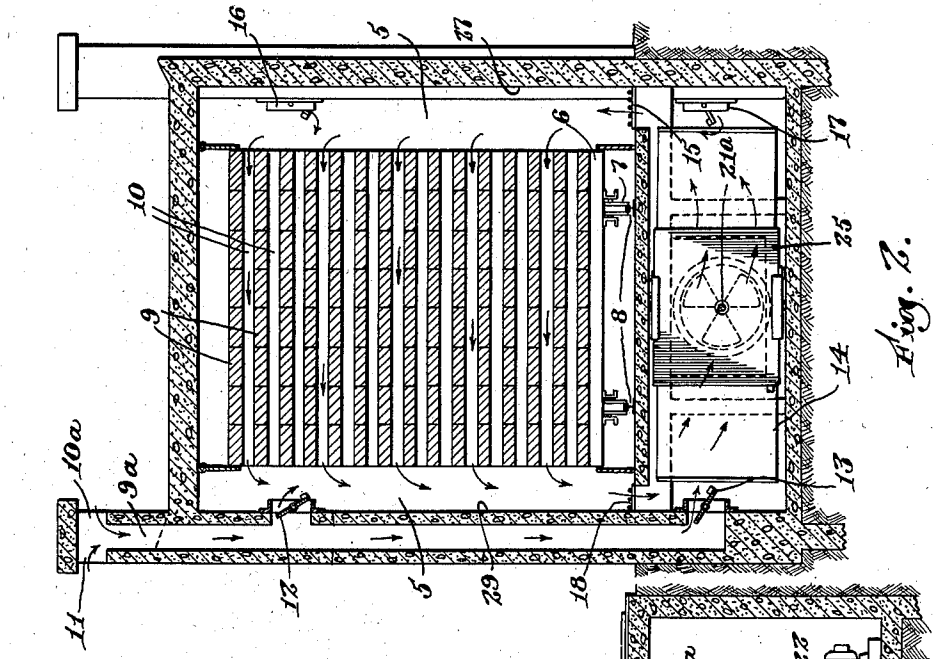


Fig. 2.

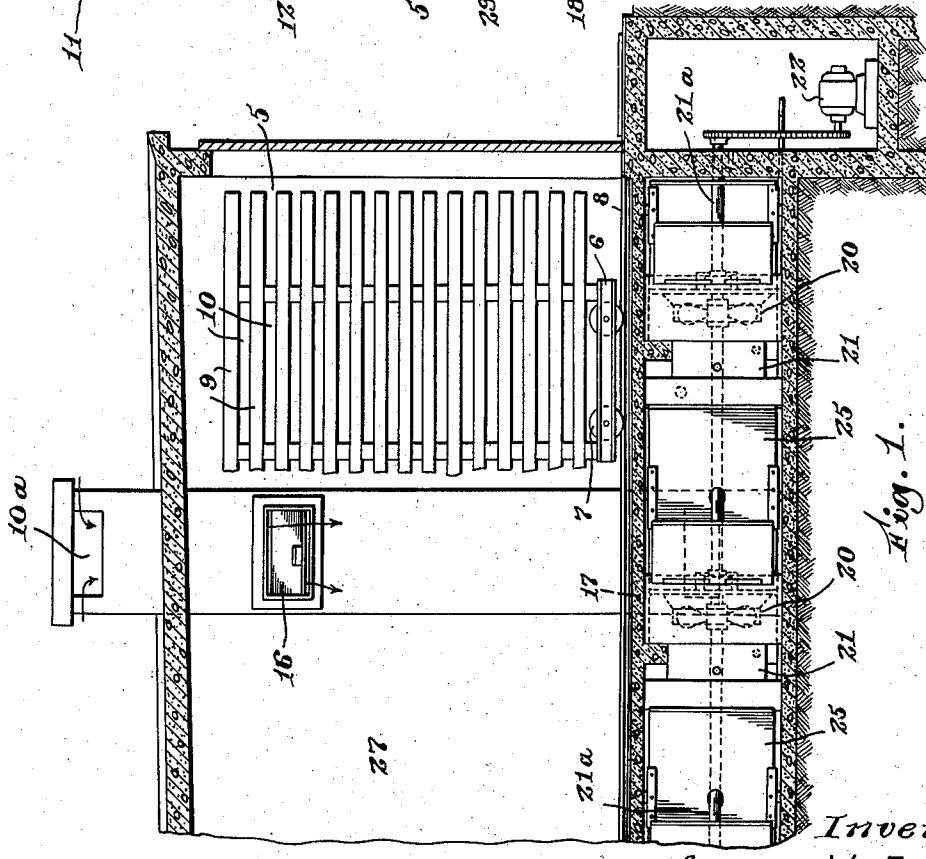


Fig. 1.

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Fig. 3.

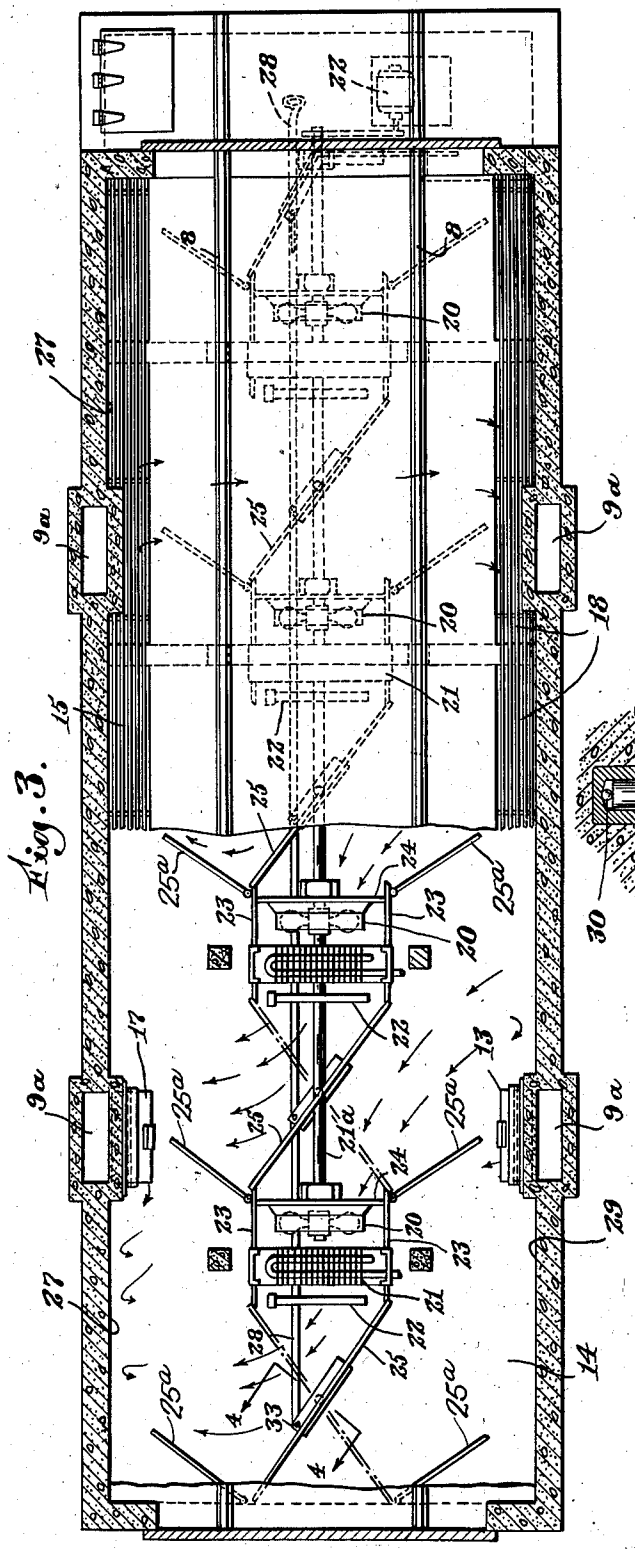
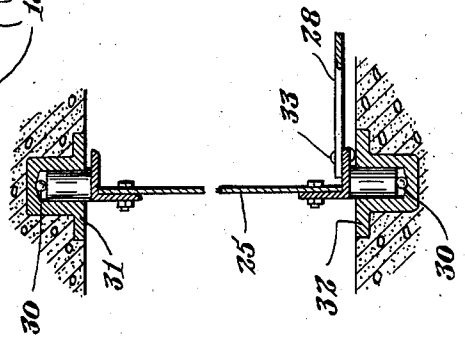


Fig. 4.



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DRYING APPARATUS

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Application March 23, 1935, Serial No. 12,609

7 Claims. (Cl. 34—46)

This invention relates to drying systems and relates more particularly to the drying of lumber and the like, in what are known as drying kilns.

In kilns for the drying of lumber in the form of boards or planks, it is customary to so stack the boards in the upper portion of a kiln, that interstices between the boards are formed and through which, heated air is blown under forced draft to dry out both sides of the lumber.

In such kilns, it has been customary to produce the forced draft of air by means of a plurality of spaced fans in a chamber below the lumber drying chamber and to heat the air with steam pipes extending longitudinally of the kiln in channels between the fan chamber and the drying chamber.

It has been appreciated that the heated air as it passes through the stacked lumber, loses through its absorption of moisture and loss of heat its effectiveness to a considerable degree, with the result that those portions of the lumber first contacted with the drying air, are benefited more than the following portions in the path of the air flow, so it has been customary to provide reversible fans for causing the drying air stream to enter first one side of the stack to be dried, and then after a period of time, the opposite side.

According to a feature of this invention, an extended surface unit heater is associated with each of the spaced fans in a drying kiln, a humidifier, extended surface heater and a fan being provided as a unit, the air being properly heated and humidified at a plurality of points adjacent the fans which produce the air movement.

According to another feature of the invention, air reversing dampers are provided between pairs of fans to cause the heated air to flow towards one side, or the other side as desired, of the kiln.

An object of the invention is to provide an efficient kiln for the drying of lumber and the like.

Another object of the invention is to provide in a drying kiln, a plurality of small compact fan and heater units in spaced relationship for producing the necessary movement of heated air.

Another object of the invention is to provide in a drying kiln, a plurality of small compact units in spaced relationship, each unit comprising an extended surface heater, a humidifier and a fan.

Another object of the invention is to reverse the air flow of constantly operating fans in a drying kiln, by means of dampers, so as to cause the air to flow toward one side or the other side of the kiln as desired.

Other objects of the invention will be apparent from the following description taken together with the drawings.

The invention will now be described with reference to the drawings of which:

Fig. 1 is an end view, partially in section, of a drying kiln according to this invention.

Fig. 2 is an end view in section of the kiln of Fig. 1.

Fig. 3 is a plan view in section of the kiln of Figs. 1 and 2, and

Fig. 4 is a sectional view along the lines 4—4 of Fig. 3.

With reference to Figs. 1 and 2, the lumber to be dried, is stacked in the drying chamber 5 upon the member 6 which in turn is mounted upon the wheels 7 which rest upon the track rails 8. The successive layers of lumber 9 are spaced apart to form a plurality of horizontal channels 10 through which the drying air is made to pass as will now be described.

Outside air enters the duct 9a through the openings 10a and 11 and passes into the drying chamber 5, past the counterweighted damper 12, at the upper portion of the drying chamber, and past the counterweighted damper 13 into the fan chamber 14. Mounted within the fan chamber 14 are the plurality of spaced fan, heat exchange and humidifying units, which as will be described in detail later, heat the air by passing recirculated air from the drying chamber 5 and outside, make-up air which enters through the dampers 12 and 13, through the air treating devices, and then force the heated air upwardly through the grille 15, where it then passes horizontally through the plurality of channels 10 between the successive layers of lumber, the air moving as indicated by the arrows of Figs. 1 and 3 to pass from the fan chamber 14, under the pressure of the fans up along one side of the stacked lumber, then through the channels 10, between the successive layers of lumber, and being drawn as recirculated air downwardly along the opposite side of the stacked lumber into the suction side of the fans.

The dampers 16 and 17 are counterweighted dampers, similar to dampers 12 and 13 respectively, but vent out exhaust air when dampers 12 and 13 admit make-up air.

As will be described in more detail later, after a period of time, which experience has indicated to be sufficient, the air flow indicated by the arrows of Fig. 2 will be reversed with the result that make-up air will enter through dampers 16 and 17, and with recirculated air will pass downwardly through the grille 15 into the fan cham-

ber 14. Treated air will be forced through the grille 18 vertically upwardly along the opposite side of the stacked lumber from that which it formerly entered and the treated air will pass horizontally through the channels 10 in a direction opposite to that indicated by the arrows of Figs. 2 and 3, and will pass downwardly through the grille 15 into the suction side of the fans in the fan chamber 14, and during this reversal of air movement, the dampers 12 and 13 will exhaust air into the duct 9a and out the openings 10a and 11.

Referring to Fig. 3, the mechanism for the treatment and reversal of air flow will now be described. There are arranged down the longitudinal center of the fan chamber 14, the plurality of spaced fans 20 which may be mounted on a common shaft 21a which is rotated by the motor 22 (Fig. 1). Associated with each fan 20 is the extended surface heating coil 21 and the humidifier 22. Each fan 20, coil 21 and humidifier 22 are mounted as a unit within the enclosure formed by the longitudinal walls 23, and by the crosswise wall 24, in which an opening is provided, to form the suction inlet of the fan.

The air moved by each fan passes its associated coil 21 and humidifier 22 and is directed by the air and reversing damper 25 and by the adjustable baffles 25a to flow towards one longitudinal side or the opposite longitudinal side of the air chamber.

As indicated by the arrows of Fig. 3, the air movement with the dampers 25 and baffles 25a in the position shown by Fig. 3 is towards the upper vertical side 27 of the kiln, the air being deflected by the vertical side 27 upwardly through the grille 15 and then through the horizontal channels between the successive layers of lumber as shown by the arrows in Fig. 2. The recirculated and outside make-up air enters the fan chamber through the grille 18.

The dampers 25 are adapted to be simultaneously reversed as shown by Figs. 3 and 4 by movement of the actuating lever 28, the dampers all being interconnected by the lever. When the lever 28 is adjusted to place the dampers 25 in the reverse position to that shown by Fig. 3, the dampers are moved to their other extreme positions as indicated by the dotted lines of the two dampers to the left of the center of Fig. 3. With the dampers so reversed, while the fan units 20 still continuously indraw air as has previously been described, the air discharged by the fans is deflected by the dampers 25 to the lower longitudinal side 29 of the compartment 14, in a direction opposite to that indicated by the arrows of Fig. 3, to be deflected by the vertical wall 29, to pass upwardly through the grille 18, into the drying chamber 5, and downwardly through the grille 15, and into the suction side of the fans, in a direction opposite to that shown by the arrows of Figs. 2 and 3.

The adjustable baffles 25a are rotatably attached at one end to enable the baffles to be adjusted to guide the air into and out of the fan units so as to provide diagonal air flow towards one end of the kiln or currents of air crosswise the kiln.

The positions of the counterweighted dampers 12, 13, 16 and 17 may be adjusted from the apparatus room to control the amount of fresh make-up air admitted and exhaust air vented.

The dampers 25 are pivoted as shown by Fig. 4 to rotate around the ball bearings 30, one of which is supported in the casing 31 mounted in the roof of the chamber 14, and the other of which is supported in the casing 32, which is mounted in the floor of the fan chamber. The lever 28 which is shown by Fig. 3 is rotatably attached to the damper at the point 33. When the lever 28 is moved from one extreme position to the other, the dampers are caused to take the position shown by the full lines or the position shown by the dotted lines on the left half, facing the drawings, of Fig. 3.

In operation, the apparatus may be first adjusted to force the air, as has previously been described, through the lumber in the direction shown by the arrows on Figs. 2 and 3 of the drawings. Referring to Fig. 3 it is seen that the air enters the right hand side (facing the drawings) of the lumber and passes through the channels 10, the air being exhausted at the left hand side of the lumber. Due to the air contacting first with the portion of the lumber adjacent the right hand side of the kiln, its effect on the lumber adjacent the left hand side of the kiln is lessened with the result that if the air moves continuously, as shown by the arrows of Figs. 2 and 3, the lumber adjacent the right hand side of the kiln will be dried more quickly than that adjacent the left hand side of the kiln.

To avoid this, after a period of time, which experience has shown to be sufficient, the dampers 25 are reversed, causing the drying air, as has previously been explained in detail, to enter the lumber at the left hand side of the kiln and to leave the lumber at the right side of the kiln, with the result that those portions of lumber which were least dried out when the air flow was in the other direction, are now dried out most, and those portions of lumber which were dried out the most when the air flow was in the other direction, are now dried out the least, so that by reversing the dampers 25 from time to time, the result is that all portions of the lumber become completely dried at substantially the same time, and the entire stack may be simultaneously removed.

The baffles 25a may be adjusted to ensure that the air movement into and out of each fan unit is uniformly distributed. In operation, observation may show that insufficient drying air is passing over one or more portions of the lumber as compared to other portions and the baffles may be adjusted to direct more or less air; as required, towards such portions as are insufficiently served.

Whereas, one embodiment of the invention has been described for the purpose of illustration, it should be understood that the invention should not be limited to the exact arrangement described, since many departures may be made by those skilled in the art, after having had access to this disclosure, without departing from the spirit of the invention.

What is claimed is:

1. A dry kiln comprising a pair of fan units arranged in spaced relationship down along the longitudinal center of said kiln, and common means comprising a reversible pivoted damper for directing diagonally the air into one of said units and for simultaneously directing diagonally the air from the other of said units.

2. A dry kiln comprising a pair of fan units arranged in spaced relationship down along the longitudinal center of said kiln, and reversible means independent of the means for rotating the fans in said units and arranged at the output

side of each of said fan units for directing the air into said units from one longitudinal side of said kiln and for directing the air discharged from said units towards the opposite longitudinal side of said kiln, said reversible means comprising a pivoted damper.

3. A dry kiln comprising a drying chamber, a fan chamber under said drying chamber, a fan unit in said fan chamber faced to blow air longitudinally thereof, and a reversible damper pivoted about a substantially vertical axis extending through a line extending substantially through the center of said unit and extending substantially parallel to a longitudinal side of said fan chamber, at the output side of said unit for deflecting the air discharged by said unit towards one or the other longitudinal side of said fan chamber.

4. A dry kiln comprising a drying chamber, a fan chamber under said drying chamber, a fan unit in said fan chamber faced to blow air longitudinally thereof, and a reversible damper pivoted about a substantially vertical axis extending through a line extending substantially through the center of said unit and extending substantially parallel to a longitudinal side of said fan chamber, at the input side of said unit for directing the air drawn in by said unit from one or the other longitudinal side of said fan chamber.

5. A dry kiln comprising a drying chamber, a fan chamber under said drying chamber, a fan unit in said fan chamber faced to blow air longitudinally thereof, a reversible damper pivoted about a substantially vertical axis extending through a line extending substantially through the center of said unit and extending substantially parallel to a longitudinal side of said chamber, at the output side of said unit for deflecting the air discharged by said unit towards one or the other longitudinal side of said fan chamber, and a reversible damper pivoted about a substantially vertical axis extending through a line extending substantially through the center of said unit and extending substantially parallel to a longitudinal side of said fan chamber, at the input side of said unit for directing the air drawn in by said unit from one or the other longitudinal side of said fan chamber.

6. A dry kiln comprising a fan chamber, a pair of fan units in said chamber arranged in spaced relationship longitudinally thereof and faced to discharge air longitudinally thereof, and a reversible damper pivoted about a substantially vertical axis extending through a line extending substantially through the centers of said units and extending substantially parallel to a longitudinal side of said chamber at the input side of one of said units and at the output side of the other of said units for directing the air drawn in by one of said units from one of the longitudinal sides of said chamber and for directing the air discharged by the other of said units towards the opposite longitudinal side of said chamber.

7. A dry kiln comprising a fan chamber having a roof and a floor, a plurality of fan units in said chamber spaced along a line extending substantially along the longitudinal center thereof and faced to discharge air towards one end of said chamber, a substantially vertical reversible damper extending substantially from the floor to the roof of said chamber, mounted between adjacent units of said plurality of units for directing air from one longitudinal side of said chamber into the units on one side thereof, and for directing air discharged from the units on the other side thereof towards the other longitudinal side of said chamber, and common means for reversing all of said dampers.

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