Jan 12, 1932. M. L. MUELLER 1,840,523

LUMBER DRYING KILN

Filed Feb. 15, 1930 3 Sheets-Sheet 1

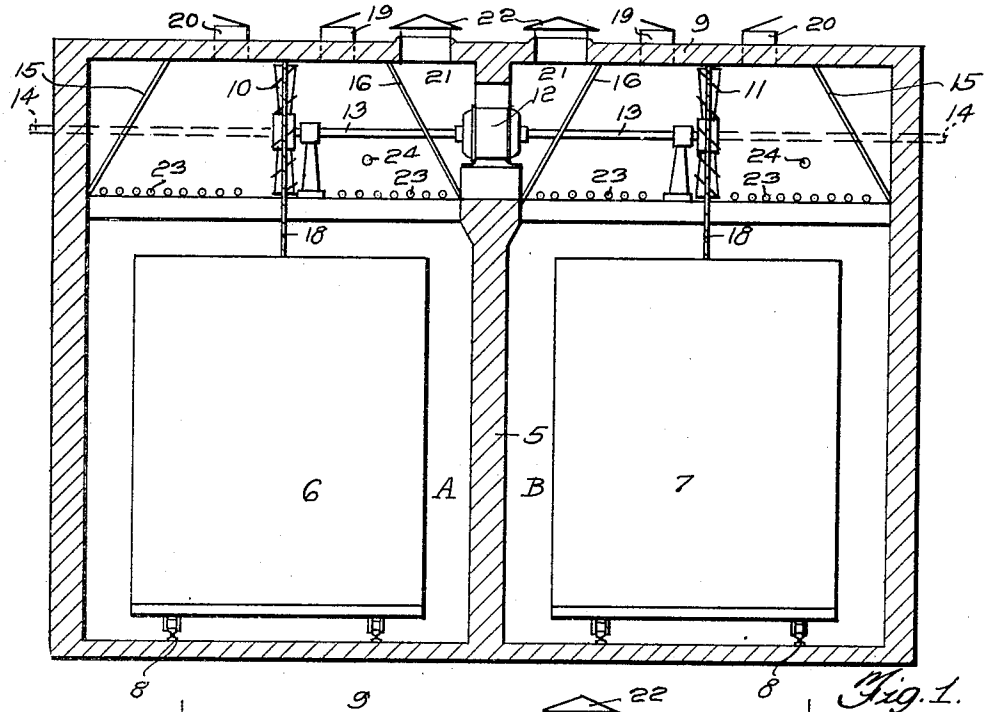


Fig. 1.

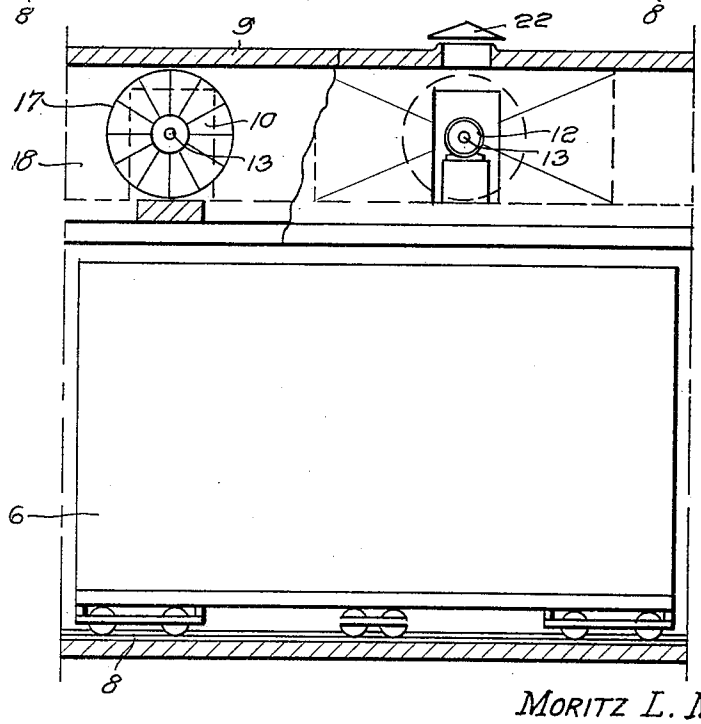


Fig. 2.

INVENTOR.
MORITZ L. MUELLER,
BY Shepherd & Campbell
ATTORNEY.

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LUMBER DRYING KILN

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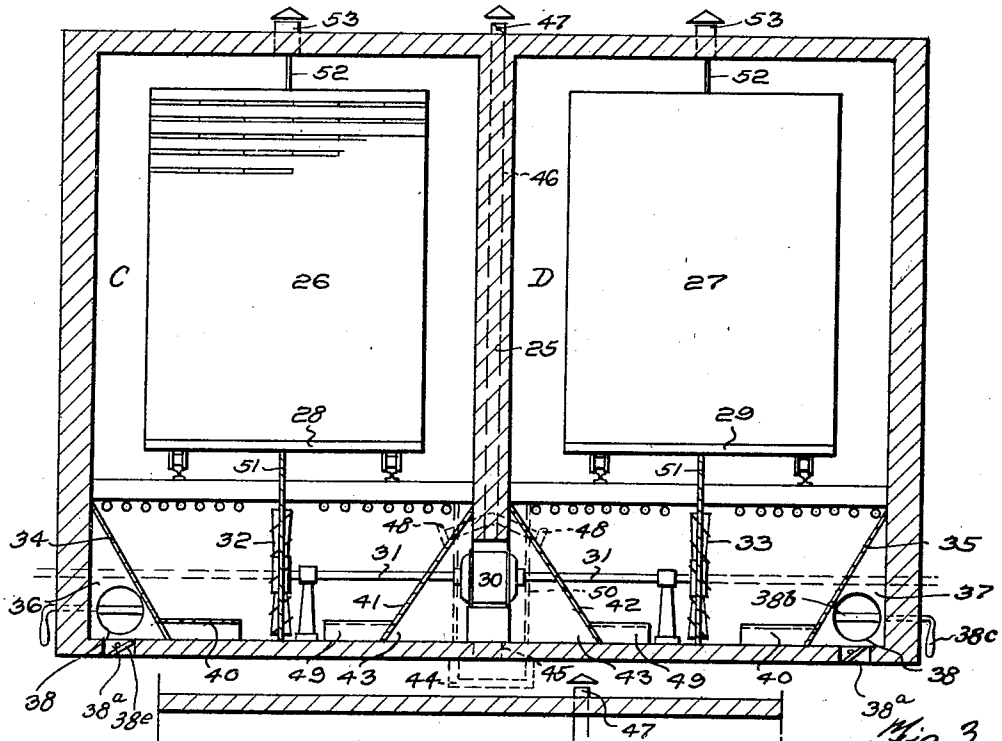


Fig. 3.

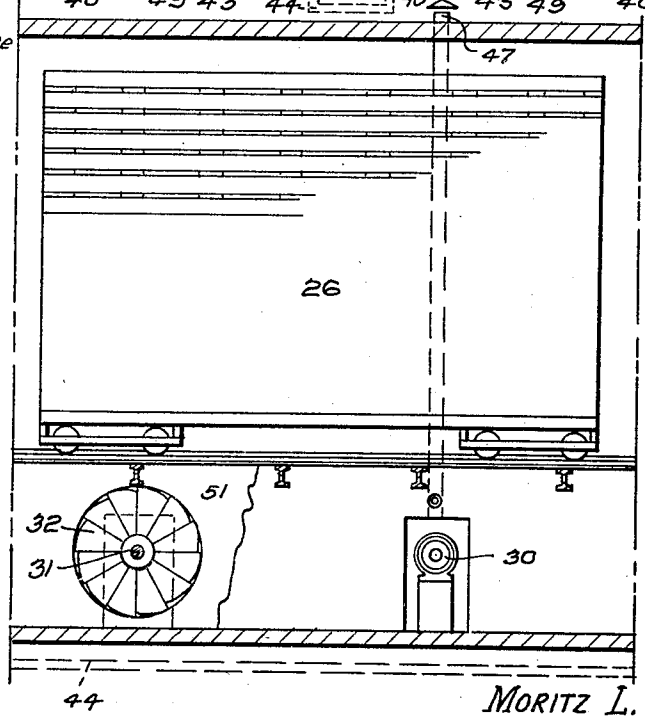


Fig. 4.

INVENTOR.

MORITZ L. MUELLER,

BY Shepherd & Campbell

ATTORNEYS

Jan. 12, 1932. M. L. MUELLER 1,840,523

LUMBER DRYING KILN

Filed Feb. 15, 1930 3 Sheets-Sheet 3

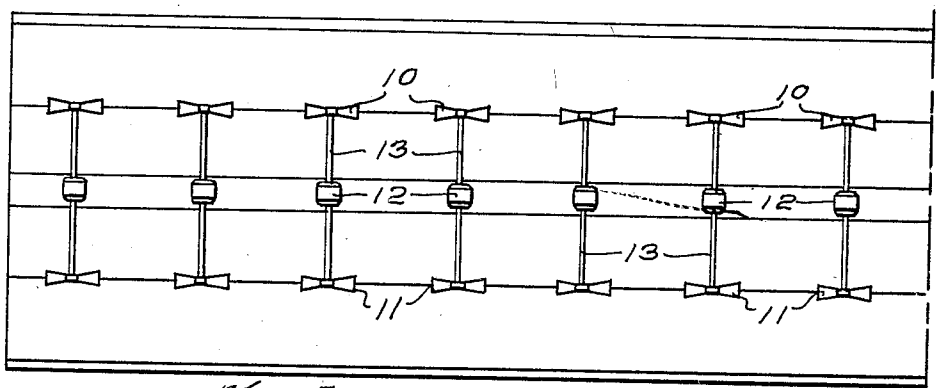


Fig. 5.

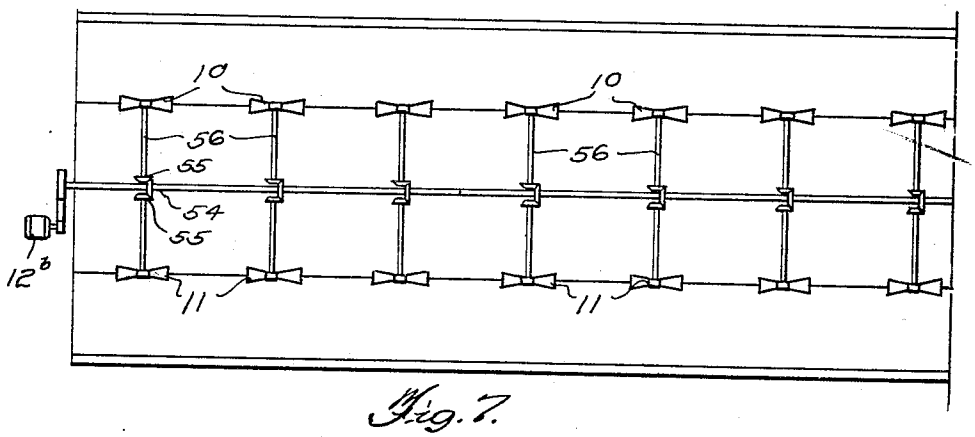


Fig. 7.

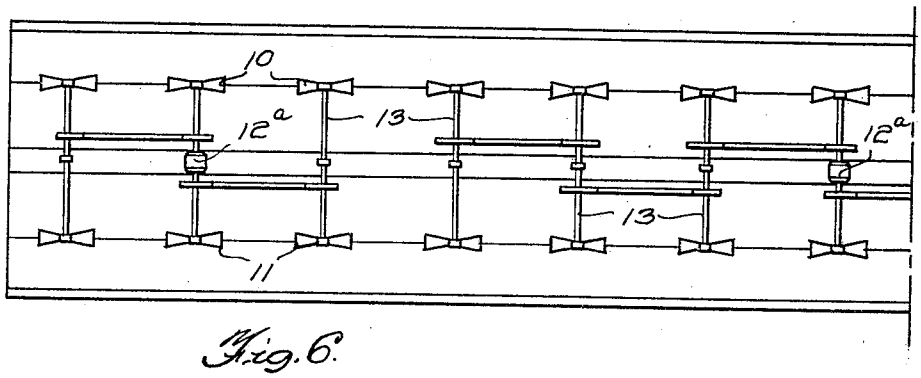


Fig. 6.

INVENTOR.
MORITZ L. MUELLER,
BY Shepherd & Campbell
ATTORNEYS

Patented Jan. 12, 1932 1,840,523

UNITED STATES PATENT OFFICE

MORITZ L. MUELLER, OF SEATTLE, WASHINGTON, ASSIGNOR TO GENERAL DRY KILN COMPANY, OF PORTLAND, OREGON, A CORPORATION OF DELAWARE

LUMBER DRYING KILN

Application filed February 15, 1930. Serial No. 428,727.

This invention relates to lumber drying kilns, and it has for its object to provide a device of this nature provided with air circulating means of such nature that marked economies in construction may be had, while, at the same time, the efficiency of the kiln is increased.

Further advantages of the invention will be set forth in the following description, based upon the accompanying drawings, wherein,

Fig. 1 is a transverse vertical sectional view through a pair of kilns, constructed in accordance with the invention,

Fig. 2 is a fragmentary longitudinal section through one of said kilns,

Fig. 3 is a transverse vertical section through a pair of kilns having the circulating fans located beneath the lumber instead of above, as in Fig. 1.

Fig. 4 is a fragmentary longitudinal sectional view of the structure of Fig. 3, and

Figs. 5, 6 and 7 are diagrammatic plan views illustrating modified forms of driving means for the fans, hereinafter described.

Like numerals designate corresponding parts in all of the figures of the drawings.

Referring to the drawings, and more particularly to Figs. 1 and 2, it will be seen that the structure is divided by a central partition wall 5, to form kiln chambers A—B. Trucks of lumber flat piled in spaced courses and indicated at 6 and 7 are run into the kiln chambers upon tracks 8, in the usual and well known way. In this particular embodiment of the invention, the kilns are provided with a flat roof 9. Located within the space between the roof and the piles of lumber and preferably substantially centrally located with respect to said piles of lumber, are disk fans 10 and 11, having, as a common driving means, electric motors 12 which operate transverse shafts 13. I have shown these shafts extended in dotted lines at 14. Additional kilns may be served by merely extending these shafts, as indicated. Outer deflectors 15, in the upper and outer corners of the kilns, and inner deflectors 16, constitute deflecting and guiding means for the air set in circulation by the fans, the air being guided and its direction changed gradually without the setting up of eddy currents. The pitch of the blades of the fan 10 is opposite to the pitch of the blades of the fan 11, so that the end thrust of one fan is counteracted by the end thrust of the other fan. These fans are preferably disposed in openings 17, formed in partitions 18, though these partitions may be omitted and still have the fans function to set up a circulation of air in the manner indicated by the arrows. The motors and fans are reversible, so that after the air has been caused to circulate in one direction, for a desired length of time, its direction of flow may be reversed, whereby a more rapid and uniform drying of the lumber is had. Exhaust and fresh air vents 19 and 20 are disposed upon opposite sides of the fans, these vents functioning as exhaust or intake vents, according to the direction of rotation of the fans. While the deflectors 15 and 16 have been illustrated as being straight, it is to be understood that these deflectors may be curved, if desired. The deflectors 16 form a pocket 21 between them, which serves to receive the driving units, i. e., the motors 12, and these pockets may be ventilated by ventilators 22. While the deflectors 15 and 16 are highly useful in adding to the stream line effect and preventing the formation of undesirable eddy currents in the corners of the kiln, it is possible to omit these deflectors and still have the kiln operate. These deflectors may be of any desired length. It will, of course, be understood that suitable air conditioning means, such as the steam coils 23 and humidifying steam nozzles 24, will be located in the path of circulation of the air discharged by the fans.

In the form of the invention illustrated in Figs. 3 and 4, kiln chambers C and D, separated from each other by a wall 25, receive the piles of lumber 26—27, flat piled in spaced courses upon trucks 28—29. Motors 30 drive transverse shafts 31, which carry the disk fans 32—33 in the manner previously described, said fans and motors being reversible and the fan blades being set in opposition to each other, so that the thrust of one counteracts the thrust of the other. The opposed setting of adjoining fans 9 renders it

possible to omit the wall 25, if desired. If the fans were not opposed, the fans at one side would steal air from the other kiln chamber, but with the fans opposed, wall 25 may be omitted, and still have uniformity of action in the two kiln chambers. Outer deflectors 34—35 enclose spaces 36—37, which are open at their ends, as indicated at 38, whereby these spaces are caused to form fresh air ducts. Openings 38 may be controlled by dampers 38^b having handles 38^c. These ducts are provided with box-like extensions 40, which extend laterally across the chambers C—D, so that the action of the fans, coupled with the rush of the circulated air past said extensions 40, induces a flow of air into the circulated air stream. Inner deflectors 41—42 enclose a pocket 43, in which the driving units are located. Where the structure is located in a basement, a ventilating duct 44 may be provided, from which air is fed through openings 45, to the motor pocket. A flue 46 extends from the motor pocket upwardly through the wall 25 and is provided with a damper or valve 47, at its upper end. Nozzles 48 are connected to these flues and extend through the deflectors 41, and into the fan chambers. The deflectors 41 likewise have extensions 49, which extend toward the fans and serve the same purpose as extensions 40. The fans suck air from nozzles 40 when running in one direction and from nozzles 49, when running in the other direction, it being understood that the ducts toward which the fans are discharging are closed, and the ducts from which the fans are drawing are opened to the atmosphere.

In both the form shown in Fig. 1 and the form shown in Fig. 3, the deflectors may be omitted, and in Fig. 1 that portion of the roof over the motor pocket may be omitted. However, I prefer to employ the arrangement illustrated. When the deflectors 41 and 42 are omitted in Fig. 3, I may, if desired, close the motor pockets in by vertical sheets, indicated in dotted lines at 50, in which case ventilating air is brought in through the holes 45, in the floor, either from a duct, such as 44, or directly through said holes 45, when no basement is employed, and the kiln bottom is above the surrounding level. The ventilating air is caused to enter the motor pockets under its tendency to rise, due to the fact that the partition wall 25 is heated. When the heat of the kiln makes further ventilation necessary, the draft effect will be increased by the use of nozzles 48. When the adjoining fans are both blowing toward the partition wall, the bell ends of these nozzles will catch a large quantity of air which, when carried to the vent pipe 46, and discharged upwardly, will induce a considerable draft through the motor pocket. When the fans are both drawing at the bell ends of the nozzles, the valve 47, at the upper end of the flue, is closed and thus the suction created by the nozzles can only be satisfied by the flow of air through the openings 45, and over the motors. This nozzle arrangement is a marked improvement over the use of outside blowers for cooling the motors, because of its economy. It is to be noted that this effect is made possible by the fact that the fans of adjoining kilns blow toward or draw from the middle wall, together. It is also to be noted that the air drawn through the extensions 49 of deflectors 41 and 42 not only provides an additional fresh air supply in the same manner that fresh air is supplied from ducts 37, but that this additional fresh air supply is drawn through the motor pockets and ventilates and cools the motors. When the kilns are located above the ground, openings 38^a controlled by dampers 38^e may be provided in the bottoms of the ducts 37, so that the air may be drawn into these ducts at different points in their length, which gives the advantage of more even delivery of air to each fan than is possible with long intake ducts. The fans 32 and 33 are, preferably, disposed in partitions 51, that are disposed substantially centrally of the kilns and, in conjunction with partitions 52, divide the opposite sides of the kiln into pressure and suction chambers.

In the form illustrated in Fig. 3, exhausts 53 are disposed in the roof, substantially above the partitions 52.

The arrangement illustrated in Fig. 1 is such that the air discharged from the fans is guided without any considerable amount of internal resistance, and without the production of eddy currents, in considerable volume, and at considerable velocity into the relatively restricted space between the pile of lumber and the side wall of the kiln, with the result that the air which is still moving downwardly, encounters the upwardly moving current of previously discharged warm air, these conflicting forces acting in the confined space to set up a lateral displacement of the air, substantially throughout the height of the pile of lumber, which, in conjunction with the suction effect produced upon the opposite side of the pile of lumber, causes the air to move actively through the passages between the several courses of lumber, in the manner described and claimed in my co-pending application, Serial Number 346,366.

The diagrammatic Fig. 5 is intended to show that there are a plurality of transverse shafts with individual driving motors for the same, and with fans upon the opposite ends of said shafts.

The diagrammatic Fig. 6 is intended to show that there may be employed, in lieu of the motors 12, motors 12^a which, in addition to being direct connected to a pair of transverse shafts, act through belts or sprocket wheels, or like connections, to drive addi-

tional transverse shafts, carrying fans at their opposite ends.

The diagrammatic Fig. 7 is intended to indicate that there may be substituted, for the motors 12, a longitudinally extending driven shaft, which is driven by a motor 12^b, located at one end of the kiln, or at any suitable point in the length of said shaft, said longitudinal shaft carrying bevel gear wheels 54, which act through bevel gear wheels 55 to drive any desired number of the transverse shafts 56.

It is to be understood that many ways will readily suggest themselves to persons skilled in the art of effecting the driving of the fan shafts and the invention contemplates the use of any practicable way of doing this.

It is to be noted that the design as a whole presents a nicely balanced structure in which the air flow will be uniform under rotation of the fans, in either direction. This is due to the fact that the fans are equidistantly spaced from the chambers into which they discharge, whether running in one direction or the other, and that the surfaces over which the air must flow are of the same shape and extent in both directions of air travel. Some of the appended claims call for pairs of kilns, and it is to be understood that this term is used in its broadest sense and includes any two kilns of a plurality of kilns, no matter how many I may see fit to employ in a battery of kilns. The cross fan set-up offers the advantage of making it possible to operate the fans in groups. As for example, to operate only alternate fans, at given times, or to combine the fans in any order, for the purpose of securing a desired air flow to meet the particular conditions existing at the moment. I find that this cross fan set-up yields from thirty to fifty percent more air, per horse power employed, than it is possible to secure with the commonly employed longitudinal shaft arrangement having the fans boxed in a series of transverse deflectors.

It is to be understood that the invention is not limited to the precise construction set forth, but that it includes within its purview whatever changes fairly come within either the terms or the spirit of the appended claims.

Having described my invention, what I claim is:—

1. The combination with a kiln structure comprising a plurality of kiln chambers arranged side by side, of a plurality of transverse shafts, centrally arranged fans in the kiln chambers carried by said transverse shafts, and a common driving means for all of said fans disposed substantially at the division line between the kiln chambers, inclined partitions in the lower corners of the kilns, the innermost of said partitions forming a pocket between them in which said driving means is disposed.

2. The combination with a kiln structure comprising a plurality of kiln chambers arranged side by side, of a plurality of transverse shafts, centrally arranged fans in the kiln chambers carried by said transverse shafts, and a common driving means for all of said fans disposed substantially at the division line between the kiln chambers, inclined partitions in the lower corners of the kilns, the innermost of said partitions forming a pocket between them in which said driving means is disposed, and means for admitting air to said pocket.

In testimony whereof I affix my signature.

MORITZ L. MUELLER.