March 8, 1932. J. B. WELCH 1,848,811

DRYING APPARATUS

Filed Jan. 16, 1929 3 Sheets-Sheet 1

Fig. 1.

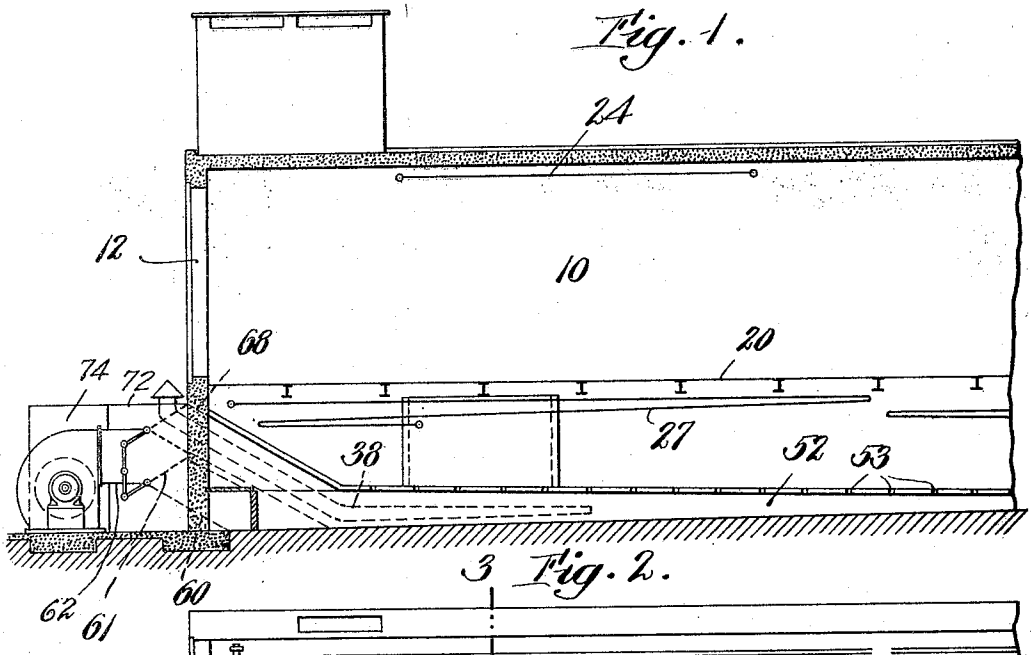
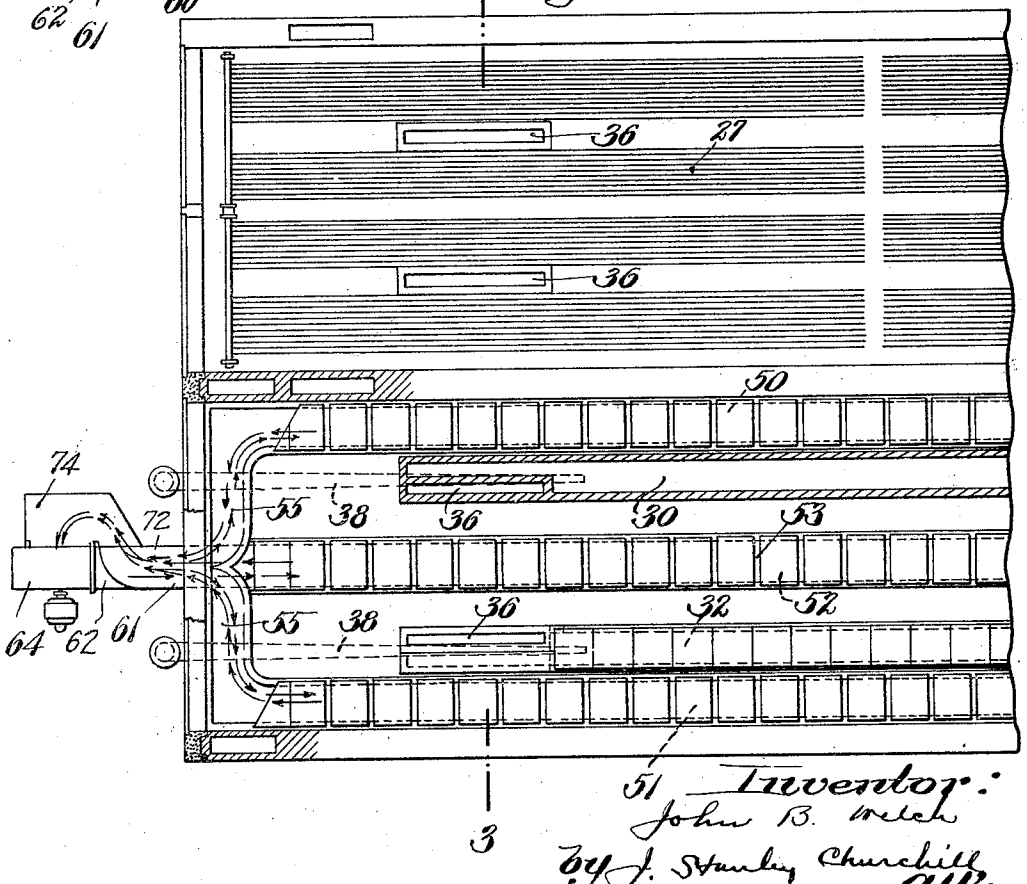


Fig. 2.



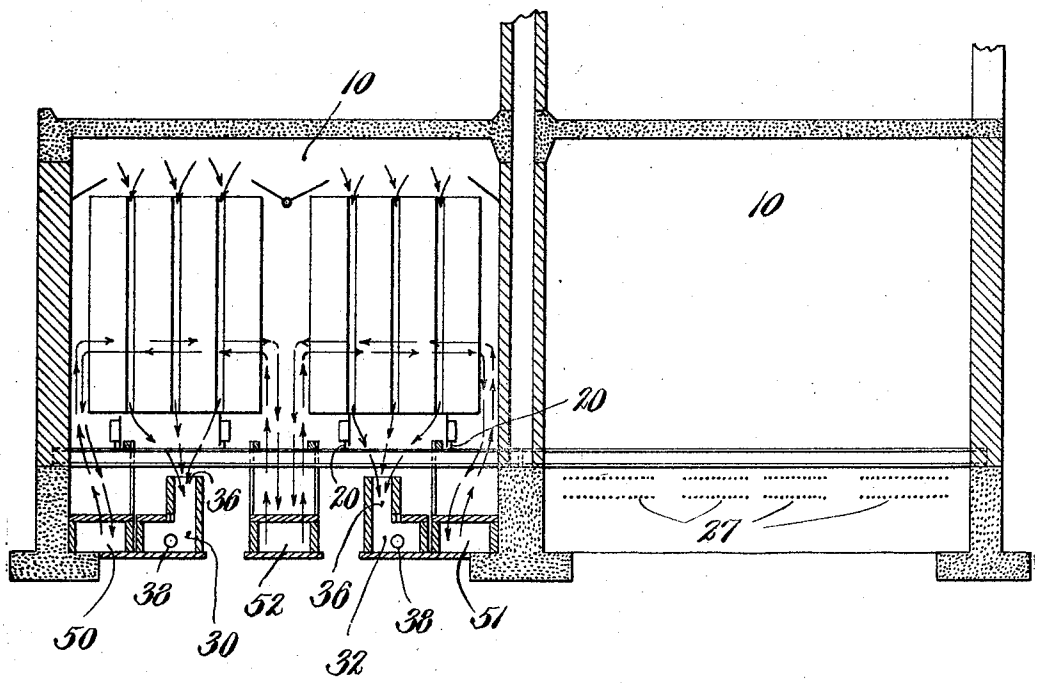
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Fig. 3.



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Fig. 4,

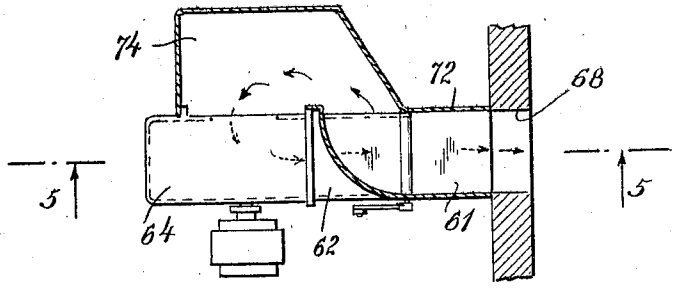


Fig. 5,

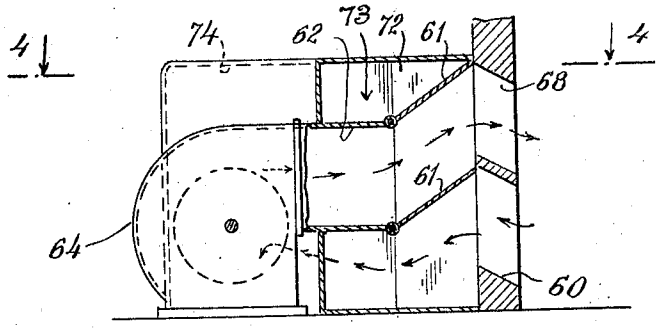
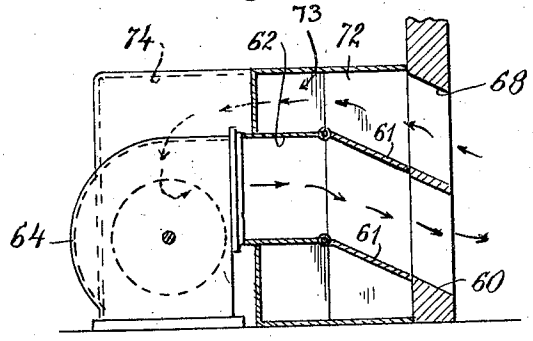


Fig. 6



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UNITED STATES PATENT OFFICE

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DRYING APPARATUS

Application filed January 16, 1929. Serial No. 332,835.

This invention relates to drying apparatus and more particularly to a progressive dry kiln for drying lumber.

The object of the invention is to provide novel and improved drying apparatus, and particularly a novel and improved progressive dry kiln for drying lumber, in which provision is made for effecting both longitudinal and crosswise recirculation of the air within the kiln in a novel and improved manner whereby increased efficiency in the drying operation may be obtained without disturbing the conditions of temperature and humidity most conducive to most efficient drying.

To this end the present improved progressive dry kiln is provided with means for effecting longitudinal recirculation of the air within the kiln, preferably by means of by-pass conduits through which the heavier moist air sinks and is conducted into one or more ducts to be moved to the dry end of the kiln and thence liberated under the lumber at the dry end. In order to maintain effective cross circulation at either the green or the dry end of the kiln, or at both ends of the kiln, the present invention contemplates the provision of air ducts arranged to permit the air to be circulated upwardly from one duct and thence crosswise of the kiln and downwardly into another duct. The ducts are connected with an air propelling device, preferably a blower, in a manner such as to permit reversal of the crosswise circulation without necessitating reversal of the blower, and in this manner the system lends itself to the use of standard types of blowers designed to operate in one direction only.

These and other features of the invention will be hereinafter described and particularly defined in the claims at the end of the specification.

In the drawings illustrating the preferred embodiment of the invention, Fig. 1 is a vertical sectional elevation of the green end of a kiln embodying the present invention; Fig. 2 is a sectional plan of the portion of the kiln shown in Fig. 1; and Fig. 3 is a cross-section taken on the line 3—3 of Fig. 2; Figs. 4, 5 and 6 show in detail, partly in section, the air current reversing mechanism for the blower.

Referring now to the drawings which for purposes of illustration show the duct system for producing the crosswise recirculation of the air as embodied in the green end of a kiln, it is to be understood that it is not desired to limit the invention to such construction. In the drawings the progressive dry kiln is illustrative as comprising a drying chamber 10 through which the lumber to be dried is passed. The chamber is provided with the usual openings at each end thereof, one of which is shown at 12, and through which the lumber is introduced into and delivered from the drying chamber. Suitable doors not shown are provided for normally closing such openings.

The lumber during its movement through the kiln is supported upon the usual track 20 and the requisite amount of humidity may be introduced into the kiln by admitting live steam from the several steam jets 24 in the manner now commonly practiced. The air within the chamber may be heated by any novel or preferred means, the herein shown heating coil 27 extending lengthwise of the heating chamber under the tracks 20.

In the preferred embodiment of the invention provision is made for setting up longitudinal recirculation in the air within the kiln from the dry to the green end thereof, and as herein shown the kiln is provided with a pair of longitudinally extending ducts 30, 32 which are provided at the green end with by-pass openings 36 through which the moist air at the green end may sink downwardly into the ends of the circulating ducts to be carried through the ducts along with fresh air admitted through the fresh air inlet pipes 38, to the dry end of the kiln where the air is permitted to rise under the lumber through a series of openings in the surface of the longitudinal ducts 30, 32, the construction being preferably that illustrated in my Patent No. 1,517,928. From the dry end of the kiln longitudinal circulation of the air takes place through the body of the kiln back to the green end. As set forth in my patent above referred to, this system of developing the longitudinal recirculation is based upon the

self-control recirculation of the air actuated primarily by differences in the density of two counter balancing columns of hot and cold air, and in the operation of the kiln the longitudinal recirculation is preferably maintained within such limits as to produce the desired drying conditions with respect to temperature and humidity.

In the practical operation of progressive dry kilns of the character described, in addition to the aforesaid longitudinal recirculation of the air, it has been found desirable to provide crosswise circulation or recirculation of the air either at the dry end, at the green end, or at both ends of the kiln, according to the particular conditions encountered in drying different types of lumber. In accordance with the present invention, novel and improved apparatus is provided for producing such crosswise recirculation of the air and in which the direction of movement of the air may be reversed without necessitating reversal of the blower or other air propelling means used. As above stated, in the illustrated kiln provision is made for producing longitudinal recirculation of the air at the green end of the kiln, and in which three air ducts 50, 51 and 52 are provided to extend from the green end of the kiln to a point substantially one-third of the length of the kiln. As illustrated two of the ducts 50, 51 may be located at the sides of the kiln and the remaining duct 52 located centrally of the kiln, so that during the operation of the kiln, air may be forced upwardly through suitable openings 53 in the surface of the central duct 52 and pass upwardly through the lumber and crosswise toward each side of the kiln to be drawn down through suitable openings 57 into the outer lateral ducts 50, 51, or in certain instances it may be desired to reverse this operation to cause the air to pass upwardly from the outer lateral ducts 50, 51, and downwardly into the central duct 52. As herein shown, each outer duct 50, 51 is connected by a transverse duct 55 which is extended upwardly and is connected through an opening 60 in the end wall of the kiln with the end of a pivoted end section 61 of the discharge pipe 62 of a blower 64, so that with the pivoted end section 61 in such a position movement of the air takes place through the outer lateral ducts 50, 51 and upwardly into the kiln. The central duct 52 is arranged to terminate in an opening 68 in the end wall of the kiln in a position such that the pivoted end section 61 of the blower discharge pipe 62 when swung into its lowered position may cooperate therewith to direct the air being discharged from the blower into the central duct 52 to cause it to move upwardly from the duct 52 and thence crosswise of the kiln and thence downwardly into the lateral ducts 50, 51, when it is desired to effect crosswise circulation in a reverse direction. Both openings 60, 68 in the end wall of the kiln are connected with the suction side of the blower through a sheet metal conduit 72 which is provided with an offset portion 74, as illustrated in Figs. 1 and 2.

A more detailed illustration of the selective operation of the blower reversing arrangement is shown in Figs. 4, 5 and 6. In Figs. 4 and 5 the end section 61 is shown communicating with the opening 68 whereby the air is blown into the chamber through that opening. The air being sucked in from the chamber through the opening 60 will pass beneath the end section 61 and discharge pipe 62, thence through the bottom part of the opening 73 leading to the offset portion 74 which leads to the suction side of the blower. In Fig. 6 the end section 61 is shown in communication with the opening 60 and with such arrangement, the air being sucked in from the chamber through the opening 68, will pass above the section 61 through the conduit 72 into the offset portion through the upper part of the offset entrance 73 and back into the blower.

From this description it will be observed that by shifting the pivoted end section 61 of the discharge pipe of the blower from a raised to lowered position or from a lowered to a raised position, it is possible to reverse the direction of crosswise recirculation of the air within the kiln, without necessitating reversal of the blower, thus permitting standard types of blowers to be utilized. In addition the blower and its operating parts may be located outside of the kiln and in such a position are accessible for maintenance.

While it is preferred to utilize a standard type of blower for producing the air movement, it will be understood that other means may be used to produce such air movement, and while the preferred embodiment of the invention has been herein illustrated and described, it will be understood that the invention may be embodied in other forms within the scope of the following claims.

Having thus described the invention, what is claimed is:—

1. A progressive dry kiln comprising, a drying chamber provided with heating means, means for producing longitudinal circulation of drying air through the material in said chamber, a duct system within said chamber for producing crosswise circulation of the drying air therein, said system comprising outer ducts located near the side walls of said chamber, and a central duct between said outer ducts, a blower located outside said chamber for propelling circulating air through said ducts, means for connecting said outer ducts with an opening in the end wall of said chamber, means for connecting said central duct to another opening in said chamber, and means for selectively connecting

the discharge side of said external blower with either of said openings whereby the direction of the crosswise circulation may be reversed without reversal of said blower.

2. A progressive dry kiln, comprising a drying chamber provided with heating means, means for producing longitudinal circulation of drying air through the material in said chamber, a duct system within said chamber for producing crosswise circulation of the drying air therein, said system comprising outer ducts located near the side walls of said chamber, and a central duct between said outer ducts, a blower located outside said chamber for propelling circulating air through said ducts, means for connecting said outer ducts with an opening in the end wall of said chamber, means for connecting said central duct to another opening in said chamber, and a movable pipe section adapted to connect the discharge side of said blower with either of said openings, and means for connecting the other of said openings to the suction side of said blower, whereby the direction of crosswise circulation may be reversed without reversal of said blower.

In testimony whereof I have signed my name to this specification.

JOHN B. WELCH.