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THE REVERSIBLE-CIRCULATION INTERNAL-FAN KILN

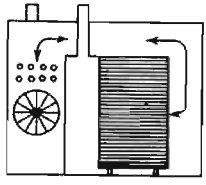
To kiln dry lumber properly, air circulation adequate as to both uniformity and volume must be provided. For most kinds of drying, the foregoing requirements can best be met by means of a kiln of the forced reversible-circulation type. The type known as the reversible-circulation internal-fan kiln, developed at the Forest Products Laboratory, is recognized as being very suitable and effective. During the past several years a large majority of the new kiln installations in the United States have been of this type. In these kilns long continuous air ducts are unnecessary and the air follows the shortest possible path, with the least possible resistance. Hence, since only very low air pressures are necessary, disk fans are usually employed because they move large quantities of air with comparatively small expenditure of power and because they can be reversed very simply and without loss of efficiency. The direction of the circulation is reversed by changing the direction of the fan rotation. By periodically reversing the direction of air movement in the kiln the normal difference in the drying rate between entering- and leaving-air boards is minimized. Moreover, this procedure tends to bring about more nearly uniform drying conditions throughout the kiln.

The internal disk-fan design can be adapted with more or less success to almost any kiln. One of the most common and satisfactory applications, however, involves an end-piled, flat-stacked, single- or double-tracked kiln in which the air moves transversely across the load.

The disk-fans may be variously located in a reversible internal-fan kiln and their location has a bearing on the location of heating coils. For example, if the fans are located near the roof of the kiln it would be natural to install the heating coils above the load. Conversely, if the fans are located beneath the load, the heating coils may well be installed at approximately the same level. If the fans are located on the side of the kiln the heating coils can be placed so as to minimize heating the lumber by direct radiation, that is, behind the fans or under the floor of the kiln.

Not only may the fans be located above, below, or at the side of the load, but they can be made to discharge either parallel or at right angles to the long axis of the kiln. An example of the parallel delivery would be where a series of disk fans are mounted on a shaft running the full length of the kiln. A kiln of this design requires a short deflecting duct for each fan to bend the air stream so as to produce either a cross or vertical circulation through loads of flat-stacked and edge-stacked lumber, respectively. When the disk fans are placed with their respective shafts at right angles to the long axis of the kiln they may be individually driven either by specially wound motors or by mounting each fan on a short shaft which extends to a place outside the drying chamber where it can be suitably rotated. In the latter type no structural ducts are necessary.

The diagrammatic sketches show typical arrangements of disk fans in end-piled flat-stacked compartment kilns. Figures 1, 2, and 3 illustrate the longitudinal shaft type of kiln with the fans located at the side, top, and bottom, respectively. Figures 4, 5, and 6 illustrate the transverse shaft type where the fans are connected to the motors either directly or by means of a relatively short transverse shaft. Figures 7 and 8 illustrate how the air can be recirculated in a double-track kiln of the longitudinal-shaft type. Air could be similarly directed in a



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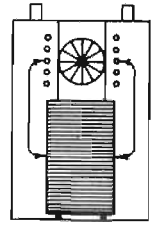

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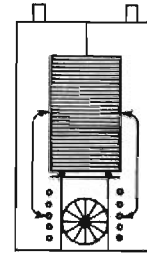

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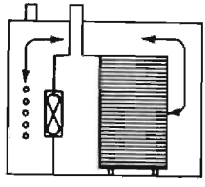

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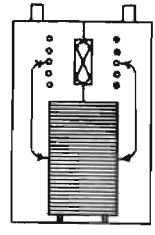

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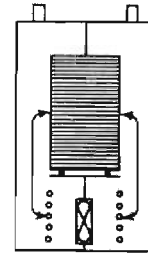

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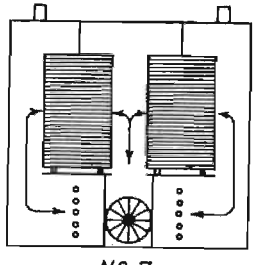

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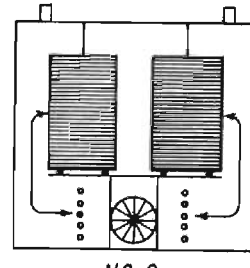

NO. 8

double-track kiln by the transverse fan arrangement shown in Figures 4, 5, and 6.

A properly designed internal-fan kiln is particularly adapted to the seasoning of all items of green lumber where fast and uniform drying is desired and when accurate control of temperature and relative humidity is essential. It may also be used to advantage in drying air-dried hardwoods and softwoods.

A series of basic patents on the internal-fan kiln has been granted to its inventors, members of the staff of the Forest Products Laboratory, who have in turn dedicated the patents to the free use of the public. In addition, improvement patents have been taken out by various inventors not in Government employ and several of these patents have been assigned to dry kiln companies.

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