(No Model.)

W. KETCHAM.

DRY KILN FURNACE.

No. 460,050. Patented Sept. 22, 1891.

Fig. 1

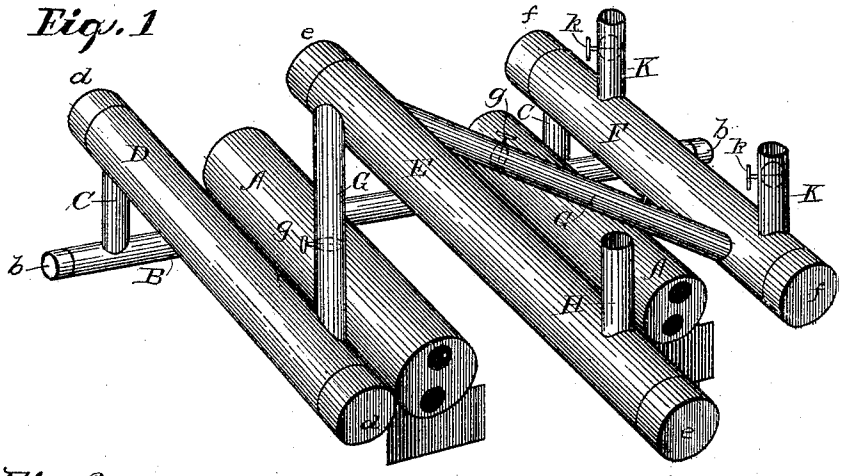


Fig 2

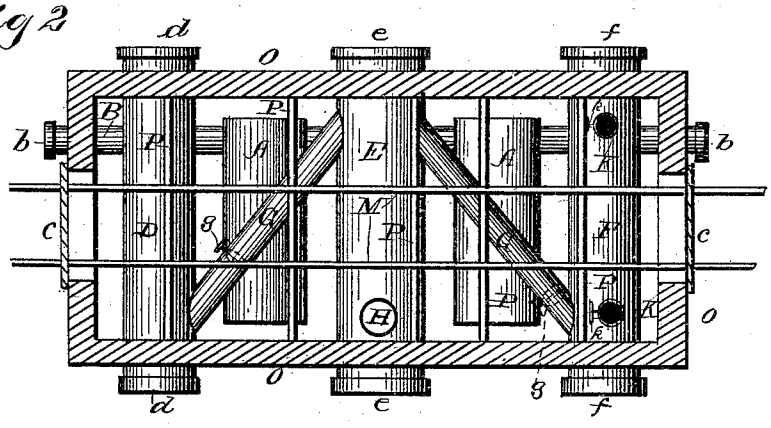
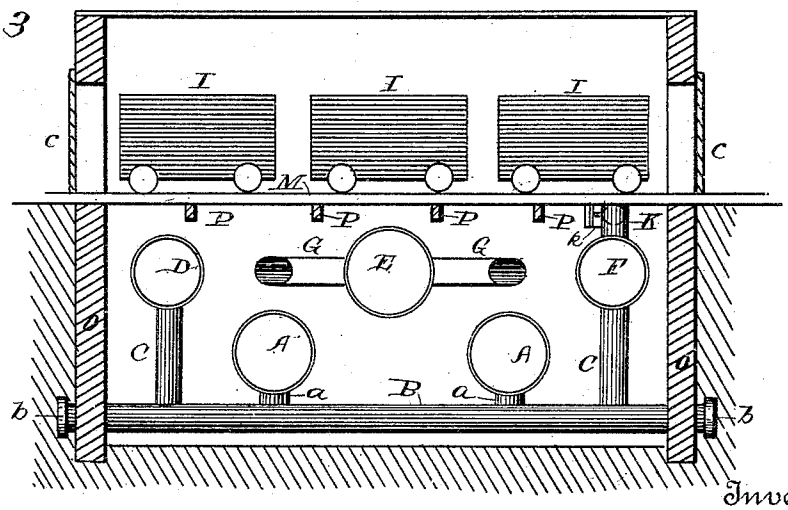


Fig 3



Witnesses

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UNITED STATES PATENT OFFICE.

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DRY-KILN FURNACE.

SPECIFICATION forming part of Letters Patent No. 460,050, dated September 22, 1891.

Application filed May 3, 1890. Serial No. 350,432. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM KETCHAM, a citizen of the United States, residing at Gladewater, in the county of Gregg and State of Texas, have invented certain new and useful Improvements in Dry-Kiln Furnaces; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, which form part of this specification.

My invention relates, especially, to that class of lumber-driers in which the lumber is moved through the kiln on cars or trucks which are introduced at one end and taken out at the other end of the building; and it consists in a peculiar arrangement of furnaces, radiating-drums, and valved connecting-flues, as will be hereinafter fully described, whereby the heat is regulated and so distributed through the kiln as to produce a varying temperature, highest at the end where the lumber is introduced and gradually diminishing toward the opposite end, where it is taken out.

It also consists in the means and provisions shown and described for smoking and "creosoting" the lumber after it has been partially or wholly dried; and it consists, finally, in details of construction and arrangement whereby deposits and accumulations of soot and ashes may be conveniently removed from the radiating-drums and their connecting-flues.

In the accompanying drawings, which form a part of this specification, Figure 1 is a perspective view showing the arrangement of furnaces, radiating-drums, and connecting-flues. Fig. 2 is a plan view of the heating apparatus, the kiln being shown in horizontal section. Fig. 3 is a longitudinal vertical section through the kiln and heating apparatus.

A represents the furnaces, which are constructed substantially as shown and described in my former patent, No. 408,724, dated August 13, 1889, and connected by short vertical flues *a* with a horizontal flue B below and running at right angles to the furnaces.

In case I use single furnaces, as shown in the accompanying drawings, fired only at one end, the flue B is located at the back end. If double furnaces are used, fired at both ends, the flue B is located centrally, as shown in my patent above referred to.

E designates a radiating-drum located above and between the furnaces A, and D F are similar drums, but somewhat smaller in diameter, located on the same plane with drum E, but on the outer sides of the furnaces. The end drums D F are connected by vertical flues C with the horizontal flue B and by diagonal flues G with the central drum E, the latter having no direct connection with the flue B. The diagonal flues G, connecting the drums, extend from the sides of the front ends of the drums D F and connect with the sides of the rear ends of the drum E, the flues thereby forming a lateral connection with the ends of the drums, so that the open ends of the flues in the drums will register with or be substantially on a line with the opening in the ends of the drums to enable the cleaning-brush to be turned into the lateral flues when it is desired to remove the accumulated ashes and soot from the pipes without separating the flues from the drums. Rising from the front end of the drum E is a draft-flue or smoke-stack H, which may be either inside or outside of the kiln, as preferred. If on the inside, it projects through the roof. If on the outside, it rises to such height as may be necessary or desirable.

The drums D E F project out through the walls of the kiln, as represented in Fig. 2, and the projecting ends are fitted with removable caps *d e f*, which may be taken off when necessary to clean out the drums and their connecting-flues. The flue B also projects out through the walls at both ends and is fitted with similar caps *b* to enable the removal of any foreign matter that may accumulate.

The flues G are provided with valves or dampers *g*, by the opening or closing of which the draft of the furnaces may be regulated and the heat thrown into either of the drums D F, as may be desired, to heat different parts of the kiln.

Rising from the drum F are short smoke-flues K, which are provided with dampers or valves *k*. These flues are within the kiln at or near the end where the lumber is taken out, and they terminate below the plane of

the cars on which the lumber is carried through the kiln. They are for the purpose of throwing the smoke from the furnaces into the kiln, the object being to smoke and "creosote" the lumber before it is taken out. It is to be understood that the lumber is introduced into the kiln at the end in which the drum D is located, as represented in the drawings.

Inasmuch as it is desirable not to begin the smoking operation until the lumber is at least partially dried, in order to avoid blackening only the last drum F at the end where the lumber is taken out is provided with smoke-flues. These flues being opened and the valves *g* wholly or partially closed at the proper stage in the drying operation, the smoke from the furnaces is thrown into the drum F, from which it escapes into the kiln under the cars of lumber, so that in rising it may pass through the latter and envelope and act upon all parts alike.

While I only show and describe two furnaces and three radiating or heating drums D E F, it is to be understood that the system may be extended and the number of furnaces and drums increased or multiplied to any extent desired, according to the size and capacity of the kiln.

The kiln is to be a tight structure without openings other than the usual doors through which the lumber is introduced and taken out, so as to prevent the escape of heat from within and the entrance of cold air from without, and so as to avoid, as far as possible, any drafts of air within or through the kiln.

I have found that lumber is better dried by subjecting it at the beginning of the operation to a high degree of heat (say 250° Fahrenheit) and gradually reducing the temperature (to, say, 120° to 140°) until it is sufficiently dried. Therefore I provide the connecting-flues G with the dampers or valves *g*, in order that the heat from the furnaces may be diverted into the proper drums to effect the necessary graduation of temperature from the end at which it is taken out, and so that in its passage through the kiln the lumber may be subjected to a gradually falling temperature, and in order that this varying and graduated temperature may be maintained it is essential that there shall be as little disturbance as possible of the air within the kiln. Hence I propose to use a tight kiln without vents or openings, as above explained.

By treating the lumber at the beginning of the drying operation with hot steam the resinous and gumming matters contained in the pores are dissolved and driven off, whereby the quality of the lumber is improved, as is well known. It has therefore been customary heretofore to steam the lumber in a separate building or in a special compartment of the drying-kiln before subjecting it to the action of hot dry air, and for this purpose a special steaming apparatus has been employed. I now propose to dispense with this special steaming apparatus and to utilize the moisture driven out of or extracted from the lumber for steaming purposes; and with this view I subject the lumber at the beginning of the drying operation to the action of hot air at a temperature of, say, 250° Fahrenheit. This at once begins to drive out the moisture, which as fast as it is driven out is converted into steam, so that the lumber is steamed with steam generated from its own moisture. This steaming operation will of course continue as long as moisture is driven off, and when this ceases the steam, being heavier than the hot air, will be absorbed by the latter and will gradually fall and be taken up by the earth which constitutes the floor of the kiln. When the lumber is sufficiently steamed, it is moved along in the kiln to a point where the temperature is lower, and so on gradually toward the end at which it is taken out, the drying thus being continued in a gradually falling temperature until it is sufficiently dried. When this stage is reached, the car on which the lumber is carried through the kiln will be at the outlet end over the drum F, and then the dampers or valves *k* in the smoke-flues K are opened, and one or both of the valves *g* are partially or wholly closed and the smoke from the furnaces thrown into the kiln over, around, and through the dried lumber.

In constructing my kiln I set it partially into the ground—that is, I excavate a pit or cellar N for the reception of the furnaces, heating-drums, and connecting-flues and build the kiln O over the same. The pit should be deep enough to bring the heating apparatus below the surface of the ground, so as to enable railway-track M to be run over the same on the level of the ground outside, as represented in Fig. 3 of the drawings. The walls of the kiln are provided at their ends with doors *c*, through which the track is laid, and the cars run in and out. I designates car-loads of lumber on the track, and P the cross-stringers upon which the track is laid.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In a dry-kiln, the combination of a series of furnaces alternating with a series of heating or radiating drums parallel to and on a plane above the furnace, the ends of the drums extending through the walls of the kiln and having removable caps thereon with lateral valved flue connections between the drums, the openings of said flue connections being at such an inclination as to register with the open ends of the drums, as and for the purpose set forth.

2. In a dry-kiln, the combination of a series of furnaces connected with a flue beneath and at right angles to the furnaces alternating with a series of heating or radiating drums on a plane above and parallel to the furnaces, lateral valved flue connections between and their openings registering with the open ends of said drums, flue connections between the

flue beneath the furnaces and drums, and valved smoke-flues opening into the kiln beneath the drying-chamber from one of the end drums, substantially as and for the purpose set forth.

3. In a dry-kiln, the combination, with the furnaces, of radiating end drums D F on a plane above and connected with the furnaces through a flue beneath and at right angles thereto, and a central drum E, located between the end drums, having one of its ends connected with the end drums by lateral valved flues registering with the openings in the ends of the drums and having at its opposite end a draft-flue H, the central drum having no direct connection with the furnaces, as and for the purpose set forth.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM KETCHAM.

Witnesses:
J. J. FLEWELLEN,
F. B. BROWN.