

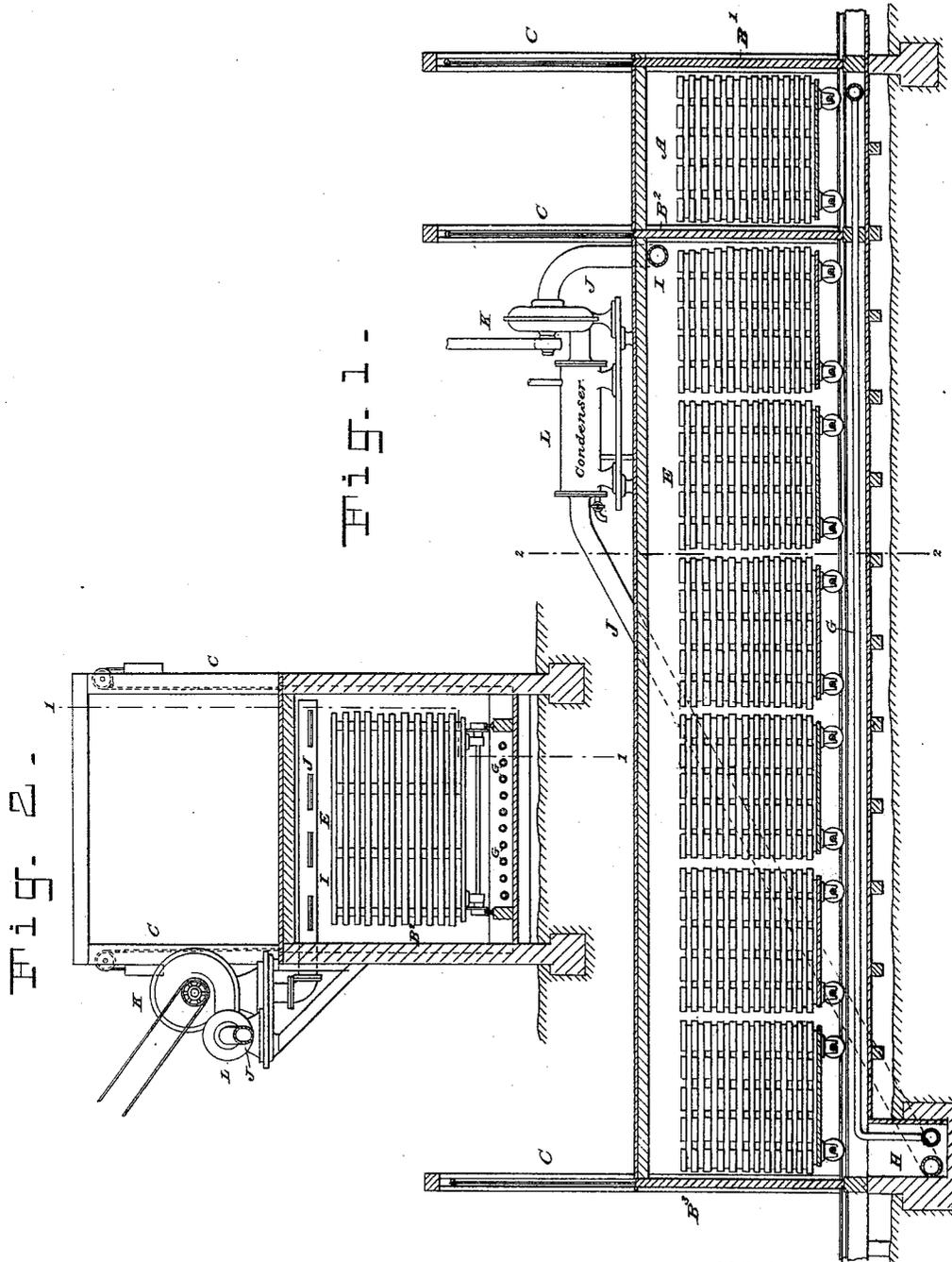
(No Model.)

G. E. FOSS.

PROCESS OF AND APPARATUS FOR DRYING LUMBER.

No. 414,204.

Patented Nov. 5, 1889.



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# UNITED STATES PATENT OFFICE.

GEORGE E. FOSS, OF ST. ALBANS, VERMONT, ASSIGNOR TO THE ST. ALBANS MANUFACTURING COMPANY, OF SAME PLACE.

## PROCESS OF AND APPARATUS FOR DRYING LUMBER.

SPECIFICATION forming part of Letters Patent No. 414,204, dated November 5, 1889.

Application filed September 16, 1885. Serial No. 177,296. (No model.)

*To all whom it may concern:*

Be it known that I, GEORGE E. FOSS, of St. Albans, in the county of Franklin and State of Vermont, have invented a new and Improved Process of Drying Lumber and Apparatus Therefor, of which the following is a specification.

This process and apparatus are designed for the drying and seasoning of lumber on a large scale. The lumber to be treated is placed on trucks or cars which travel on a track extending through a sweating and a drying chamber. The lumber is first introduced into the sweating-chamber, wherein it is heated and steam is introduced and brought into direct contact with it, this treatment being continued until the wood is heated throughout and its pores are thoroughly opened. The lumber is then passed into one end of the drying-chamber, where it is again heated, and is subjected to the action of a current of air which absorbs the moisture from its surface. From time to time the charge of lumber is moved forward in this chamber, and as it advances it encounters air continually less hot and drier, whereby as it becomes itself more dry the air which acts upon it is also drier, so that no moisture condenses upon the lumber, and accordingly when it reaches the discharge end of the chamber it is thoroughly dried. The air circulates through the drying-chamber from the discharge to the receiving end thereof, being dried by means of a condenser before entering the chamber.

Figure 1 in the accompanying drawings shows my improved apparatus in longitudinal vertical section. Fig. 2 shows it in transverse vertical section cut on the line 2 2 in Fig. 1.

Let A designate the sweating-chamber and E the drying-chamber, the latter being a continuation of the former, and a railway-track being extended through both. A sliding door B' closes the entering end of the chamber A, a second door B<sup>2</sup> separates the chamber A from the chamber E, and a third door B<sup>3</sup> closes the discharge end of the latter chamber. These doors are shown as arranged to slide upwardly, being guided by vertical guides or ways C C. They are to be opened

to admit and discharge the cars or trucks carrying the stacks of lumber.

The chambers A and E are heated by suitable means, preferably by a steam coil or radiator G, which is arranged close above the floor of the chambers, and preferably between the track-rails, as shown in Fig. 2. The drying-chamber E is in free communication with the steam-coils therein throughout the length thereof.

The truck-load of lumber is placed in the chamber A, and is heated by means of the coil G therein until it is raised uniformly to a sufficient temperature, which should be in the neighborhood of 125° to 150° Fahrenheit. When the wood has become sufficiently warmed, steam is turned into the chamber A by opening a valve (not shown) in the radiator G, or in an independent steam-pipe, as may be preferred. The wood is thus moistened and sweated for as long a time as may be necessary to thoroughly open its pores. The proper duration varies with the kind of wood and with the size of the lumber, but is usually about twenty-four hours. After the lumber has been sufficiently steamed it is passed immediately into the drying-chamber E. A circulation of air is maintained through the drying-chamber from the lower discharge end H to the upper receiving end I, and a return-pipe J, extending from the end I to the end H, completes the air-circuit. The circulation of the air in the direction indicated is induced by any suitable pneumatic appliance—such as a fan-blower K—located at any convenient point on the return-pipe J. As the air passes through the drying-chamber it absorbs moisture from the lumber under treatment, and this moisture is extracted in the return passage through the pipe J by the air being drawn or forced through a condenser L, of any approved form, located in the return-pipe. In passing through the condenser the air is dried, and at the same time cooled, and it re-enters the drying-chamber dry and comparatively cool. Preferably the return-pipe opens into a pit extending below the floor of the drying-chamber.

In passing through the drying-chamber the air is gradually heated by the steam-coils, so

that when the air escapes from the chamber it is at its highest temperature. More or less of the air in passing through the drying-chamber will come in direct contact with the steam-coils, and on being heated thereby will rise and mingle with the air passing through the central portions of the chamber, thus constantly raising the temperature of the same. The air is thus heated in passing through the drying-chamber, owing to the fact that the heating-coils are in free communication with the chamber throughout the length thereof, so that the longer air remains in the chamber the higher it will be heated. The temperature in the drying-chamber should not be permitted to exceed that of the steaming-chamber, since to attain the best results the lumber should not be subjected to any very high degree of heat. The drying process takes usually at least five or six times as long as the steaming process, and therefore the drying-chamber should be made at least five or six times as long as the steaming-chamber; hence where the steaming-chamber is made long enough to receive one truck or car the drying-chamber is made long enough to receive five or six or more trucks or cars. As a result of this arrangement the drying-chamber always contains lumber which is in varying conditions as to dryness, lumber moist throughout being contained at the ingress end, or next to the steaming-chamber, whereas the lumber at the egress or discharge end is almost or quite completely dried. This arrangement is essential to the economical drying and seasoning of lumber in quantities by a continuous operation, and the application of the air-circulation and heating mechanism to this apparatus is especially designed to most satisfactorily and economically accomplish the best possible results. I prefer that the coil G shall consist of two headers with a series of parallel pipes passing from one to the other, and that the steam shall enter the header at the end H of the chamber E and pass simultaneously through the several pipes to the header at the opposite end of the coil in the chamber A. I then introduce exhaust-steam to the coil, so that the portion of the latter nearest the end H shall be much the hottest, in order to heat the incoming air, which has been cooled by the condenser, and also by radiation to maintain the nearly-dried lumber at a sufficient temperature to expel the residue of moisture therefrom. The steam remaining uncondensed after passing through the coil (or some of it) may be advantageously used to moisten the lumber in the chamber A.

Hitherto lumber has been treated by being first subjected to a sweating process in a steaming-chamber, and being then subjected to a longer drying process in a proportionally-longer drying-chamber; but the difficulty hitherto has been that while in the drying-chamber the lumber throughout its treatment and in every portion of the chamber has been subjected to an excessively-hot atmosphere.

The air in these cases enters the drying-chamber at one end while hot and circulates through the chamber, heating and parching the lumber, and being itself cooled as it approaches the moister lumber, so that as the need for its absorbing moisture increases its absorptive power decreases.

In my present apparatus the air enters the chamber fresh from the condenser very dry and comparatively cool, and it first comes in contact with the driest lumber, and as it passes through the chamber it comes successively in contact with successively-moister lumber, and is itself at the same time raised to a successively-higher temperature, being thus continually rendered more and more susceptible of absorbing the moisture from the lumber. Thus as the air meets the lumber in the different stages of moisture it is heated gradually, and is thus rendered capable of absorbing a portion of the moisture from each successive truck-load of lumber. As the air is drawn positively through the chamber by the fan-blower, its circulation can be so regulated that when it leaves the chamber and enters the return-pipe it will be thoroughly saturated with all the moisture it can retain at the maximum temperature which it receives in the chamber. Thus the apparatus can be worked to its entire capacity and great economy can be attained. Also, owing to the air being drawn positively through the chamber in the proper direction, there are no adverse currents within the chamber, and consequently the air never comes in contact with any lumber cooler than itself upon which it could deposit moisture. The lumber is thus submitted to a uniform treatment, and is dried gradually, being subjected, as it is from the time it enters the drying-chamber till its discharge therefrom, to an atmosphere which is gradually drier and drier as the lumber itself becomes drier and drier. The amount of drying which the lumber receives in different portions of the chamber and in equal times is therefore approximately uniform, which is conducive in the highest degree to the attainment of the best results. Where lumber is subjected throughout the drying process to an atmosphere uniformly hot and with the conditions of capacity for absorbing moisture either left to chance or disregarded altogether, an unequal drying and warping, checking, and hardened surfaces are the inevitable results, thereby rendering the lumber of inferior quality.

By the employment of the apparatus herein described the uniform drying of the lumber is very perfectly attained and the quality of the lumber produced is most superior.

I claim as my invention—

1. In the process of drying lumber, passing the lumber from one end of the drying-chamber to the other during the process of drying and passing a current of air through said chamber in the opposite direction, said air being introduced into said chamber compara-

tively cool and dry and being gradually heated to a successively-higher temperature during its passage through said chamber, substantially as set forth.

5 2. In the process of drying lumber, passing the lumber from one end of the drying-chamber to the other during the process of drying, passing a current of air through said chamber in the opposite direction, and heating  
10 said air during its progress through said chamber, whereby said air, being introduced into said chamber comparatively cool and dry, becomes gradually heated to an increasingly-  
15 higher temperature during its passage through said chamber, substantially as set forth.

3. A closed drying-chamber into one end of which lumber in a moist condition is introduced and from the other end of which  
20 the dried lumber is discharged, and heating appliances arranged to heat the contents of said chamber, in combination with an air-pipe which communicates at one end with  
25 said drying-chamber at the ingress end thereof and at the other end with said drying-chamber at the discharge end thereof, a condenser located in said pipe, and pneumatic  
30 appliances which establish a current of air through said chamber from the discharge to the ingress end thereof, and thence backward

through said pipe and condenser, substantially as set forth, whereby the lumber under treatment, as it approaches completion, is subjected to a successively-drier atmosphere.

4. A closed steaming-chamber, a steam-in- 35  
let pipe communicating therewith, a closed drying-chamber of a length exceeding that of the steaming-chamber, a sliding partition between said steaming and drying chambers,  
40 doors or gates closing the open ends of said chambers, and a continuous track extending through said chambers, in combination with heating appliances arranged in the lower portion of said drying-chamber, an air-pipe which  
45 communicates at its one end with the ingress end of said drying-chamber and at its other end with the discharge end of said chamber, a condenser located in said pipe, and pneumatic  
50 appliances which establish a current of air through said chamber from the discharge to the ingress end thereof, and thence backward through said pipe and condenser,  
substantially as and for the purposes set forth.

In witness whereof I have hereunto signed  
my name in the presence of two subscribing  
55 witnesses.

GEO. E. FOSS.

Witnesses:

ARTHUR C. FRASER,  
GEORGE H. FRASER.