

F. K. FISH, JR.
 PROCESS OF DRYING LUMBER.
 APPLICATION FILED APR. 23, 1919.

1,328,655.

Patented Jan. 20, 1920.
 2 SHEETS—SHEET 1.

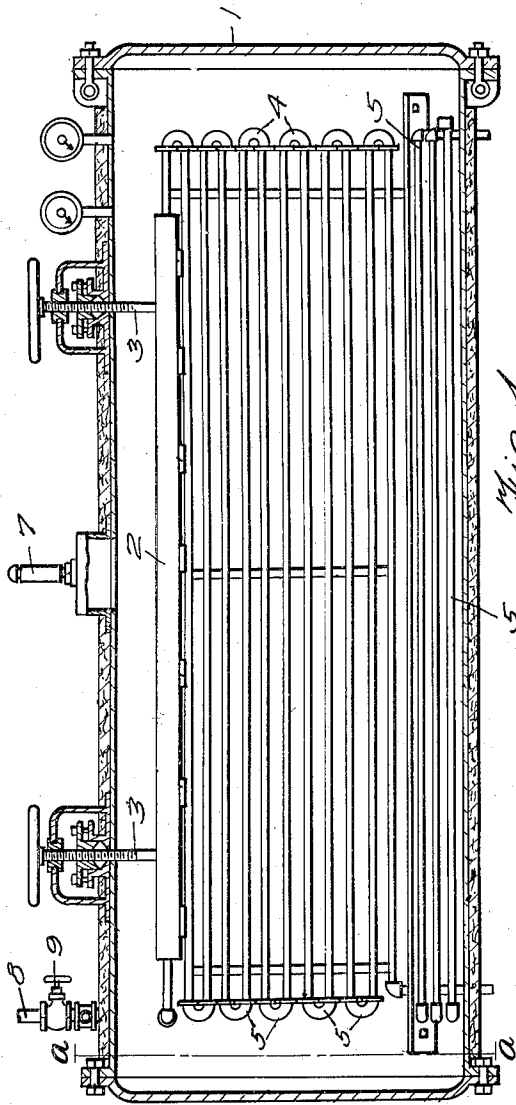


Fig. 1.

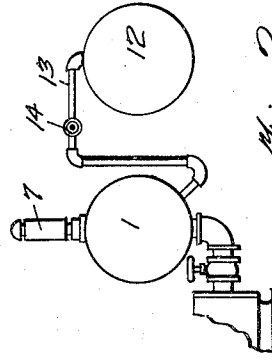


Fig. 3.

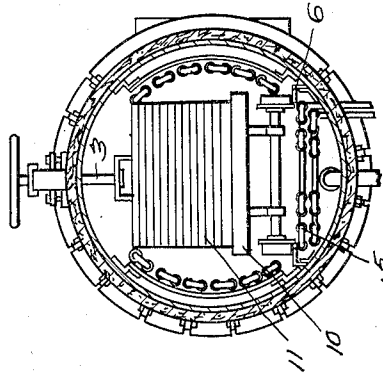


Fig. 2.

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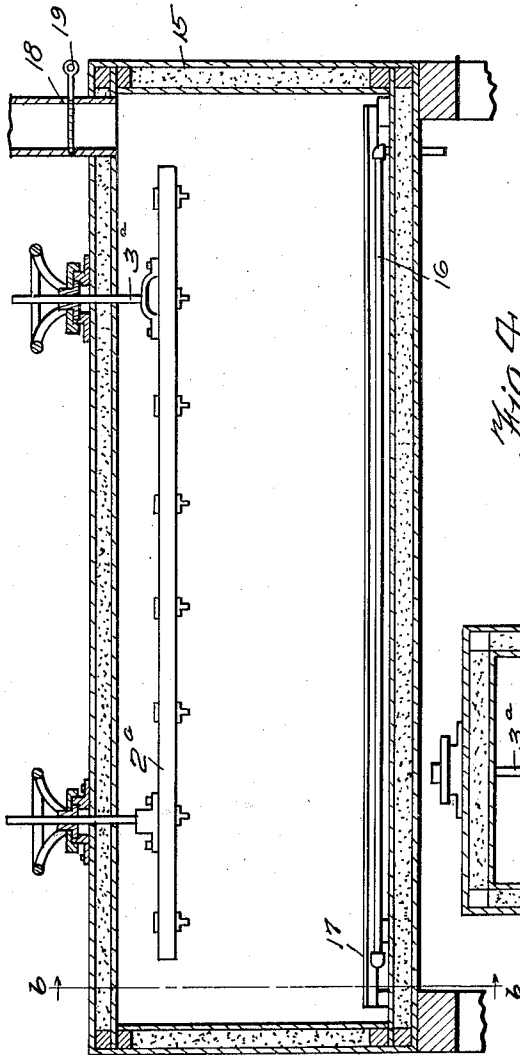
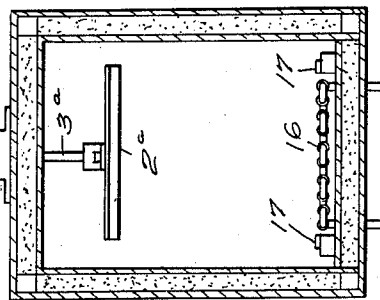


Fig. 4.

Fig. 5.



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UNITED STATES PATENT OFFICE.

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PROCESS OF DRYING LUMBER.

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Specification of Letters Patent.

Patented Jan. 20, 1920.

Application filed April 23, 1919. Serial No. 292,053.

To all whom it may concern:

Be it known that I, FREDERICK K. FISH, Jr., a citizen of the United States of America, residing at 2 Stone street, New York city, in the county of New York and State of New York, have invented certain new and useful Improvements in Processes of Drying Lumber, of which the following is a specification.

The present invention is based upon a proper recognition of the physical characteristics of wood structure, the chemical constituency of its fluid content, and has for its object the removal from the wood of those substances which, under natural conditions, form the basis of its deterioration or destruction, and subsequently drying the wood.

Structurally, wood consists of a skeleton of cellulose intermingled with other organic substances, collectively designated as lignin, together with a minor proportion of mineral matter or ash. Lignin, while not fully understood chemically, is closely allied to the cellulose element of the wood, and since it forms a part of the permanent structure of the wood, it may, for the purposes of the present invention, be regarded as identical with the cellulose.

I am aware, that for the obtaining of the objects above set forth, that wood has been subjected to steam with and without pressure, thereafter drying the wood in kilns from which the accumulating moisture is withdrawn continuously. I have found that by placing wood in a suitable container and surrounding it with a body of live steam under pressure while simultaneously supplying dry heat to the interior of the container, that a much better and efficient result is obtained, for the reason that the combined action of the dry heat and the live steam under pressure on the lumber is such that, while the steam prevents the heat from too quickly drying the surface of the lumber, a condition which would prevent the penetration thereof by the steam, the dry heat raising the temperature of the lumber to such a degree as to prevent the condensation of the steam in the cells thereof by its suddenly coming in contact with the cold lumber, a condition which has proven a

serious objection to the process heretofore used, when steam, under pressure, is the treating medium.

It will be found that where wood is subjected to the combined action of live steam under pressure and dry heat, that the wood piece will become heated through and through and the steam and dry heat will penetrate to the center of the wood piece, the steam thereby coming in contact with the sap globules bursting them. Where dry heat is applied simultaneously with the steam under pressure, the center of the wood piece will be brought to the same temperature as the surface thereof, causing evaporation from the center outwardly.

If wood is subjected to a body of live steam under pressure without the accompanying action of dry heat, the steam, on being forced into the cells of the wood piece, will become condensed therein, thereby adding to the already aqueous content of the wood, which will result in materially lengthening the time required for drying it thereafter. It is a well settled fact that a comparatively small amount of heat will maintain a given temperature in a drying chamber when the aqueous content of the wood in such chamber has been previously reduced, as compared with wood from which a portion of the aqueous content has not been previously reduced, so that the disadvantages of the condensing of the steam within the cells of the wood, thereby doubly loading it with aqueous matter, can be readily seen.

While if dry heat and live steam under pressure are simultaneously applied, the wood is kept in a heated condition and the steam prevented from condensing in the cells of the wood, and since steam has an affinity for moisture, the aqueous content of the wood will be taken up by the steam and will evaporate therefrom with the steam.

There is a vital difference between continuously removing the accumulating moisture from the drying chamber and removing such moisture periodically, for if the moisture be removed continuously, by opening a vent in the container for instance, the wood will dry and become hard at the surface, which results in checking, while if the

moisture be removed periodically the surface of the wood can be kept in a warm, moist condition, which condition insures against checking.

5 By way of teaching the invention more in detail, the approved method of practising the same will be described with reference to the accompanying drawings, in which—

10 Figure 1 is a vertical, longitudinal section of a container, suitable for carrying out the first step of the process.

Fig. 2 is a section taken on line *a—**a* Fig. 1.

15 Fig. 3 illustrates diagrammatically means for controlling the condition within the container.

Fig. 4 is a vertical, longitudinal section of a drying chamber.

20 Fig. 5 is a section taken on line *b—b* Fig. 4.

Referring to the drawings more specifically, reference numeral 1 represents a container of construction suitable for containing steam under pressure, and is provided 25 with a presser plate 2 with adjusting screws 3 through means of which the charge of wood may be kept under pressure to prevent warping while being treated. It is also provided with heating coils 4 by which 30 the temperature of the atmosphere or steam within the container may be heated to the desired degree; and with pipes 5 which are perforated for the purpose of supplying live steam to the interior of the container 35 when desired. 6 represents a track to receive the car or truck upon which the wood is loaded for introduction into the container. 7 is a safety valve. 8 is an escape pipe which is provided with valve 9 for controlling the pressure within the container 1 40 at will. 10 is a car upon which wood 11 is loaded for introduction into the container 1. 12 represents a boiler for generating steam and is connected to container 1 by 45 pipe 13 which is supplied with a suitable valve 14 for controlling the flow of steam into container 1.

Referring to Figs. 4 and 5, 15 represents the drying chamber which is provided with 50 a pressure device 2^a, 3^a, similar in structure to that employed in the container 1. 16 are heating pipes preferably located at the bottom of drying chamber 15 and are for the purpose of introducing dry heat thereinto. 55 17 is a track for the convenient introduction into drying chamber 15 of a car load of wood and 18 is a stack which is provided with damper 19 and is for the purpose of removing from drying chamber 15 the accumulating moisture from around the wood 60 at will.

In carrying out the process with the apparatus above described, a suitable charge of wood loaded on a truck is introduced into 65 the container 1, which is then hermetically

closed and steam supplied through the spray pipe 5, and heat supplied through the operation of pipes 4.

To create the next step, the container 1 is opened and the load of wood is removed 70 therefrom and transferred as rapidly as possible to the drying chamber 15, the load being preferably covered to minimize loss of heat during the transfer. Container 1 is now ready to repeat the first step of the 75 process while the last step is being carried on in the drying chamber 15, said chamber being already heated is closed upon the load of wood, the heating pipes 16 are operated sufficiently to keep up a temperature favor- 80 able to continuous evaporation of moisture from the wood, and the damper 19 in the stack is opened periodically to create a draft or current of air for carrying off the moisture as it accumulates, or may be kept 85 open continuously for this purpose.

From the foregoing, it will be seen that the first essential condition to be produced is the thorough heating, softening and opening up of the wood structure and the dis- 90 solving of its sap matters, which condition is obtained by subjecting the wood to a steam bath, under pressure, while simultaneously applying dry heat; the final step brings about complete drying under conditions that 95 evaporate remaining moisture at atmospheric pressure in a sufficiently gradual manner to avoid taking the resin away from the wood structure.

What I claim is:

1. The process of drying lumber, which 100 consists in subjecting the lumber to a body of live steam under pressure, while simultaneously applying dry heat, then subjecting the lumber to a body of dry heat while 105 periodically removing the accumulating moisture from around the lumber.

2. The process of drying lumber, which 110 consists in subjecting the lumber to a body of live steam under pressure while simultaneously applying dry heat, then subjecting the lumber to a body of dry heat until dry, keeping the lumber under mechanical 115 pressure during all the steps of the process.

3. The process of drying lumber, which 120 consists in subjecting the lumber to a body of live steam under pressure while simultaneously applying dry heat, then subjecting the lumber to a body of dry heat while removing the accumulating moisture from 125 around the lumber and keeping the lumber under mechanical pressure until dry.

4. The process of treating wood, which 130 consists in producing in a retort a body of free steam under pressure around the wood, while applying a dry heat to the wood, and then subjecting the wood to a dry heat while periodically removing accumulating moisture from said retort.

5. The process of treating wood, which 135

consists in producing around the wood while in a retort, a body of free steam under pressure, and then transferring the wood from said retort into an equalizing chamber and then subjecting the wood to dry heat while removing the accumulating moisture from the equalizing chamber.

6. The process of treating wood, which consists in producing around the wood while in a retort, a body of free steam under pressure and then transferring the wood while covered, from said retort, into an equalizing chamber and then subjecting the wood to dry heat while removing the accumulating moisture from the equalizing chamber.

7. The process of treating wood, which consists in producing around the wood while in a retort, a body of free steam under pres-

sure, and then transferring the wood from said retort into an equalizing chamber and then subjecting the wood to dry heat while removing the accumulating moisture from the equalizing chamber, the treatment being carried out while the wood is under mechanical pressure.

8. The process of drying lumber, which consists in subjecting the lumber to a body of live steam under pressure while simultaneously applying dry heat, then transferring the lumber and while in transit preventing the escape of heat, and then subjecting the lumber to drying heat while periodically removing the accumulating moisture.

In testimony whereof I affix my signature.
FREDERICK K. FISH JR.