(No Model.)

4 Sheets—Sheet 1.

D. F. NOYES.

LUMBER DRIER.

No. 286,552. Patented Oct. 9, 1883.

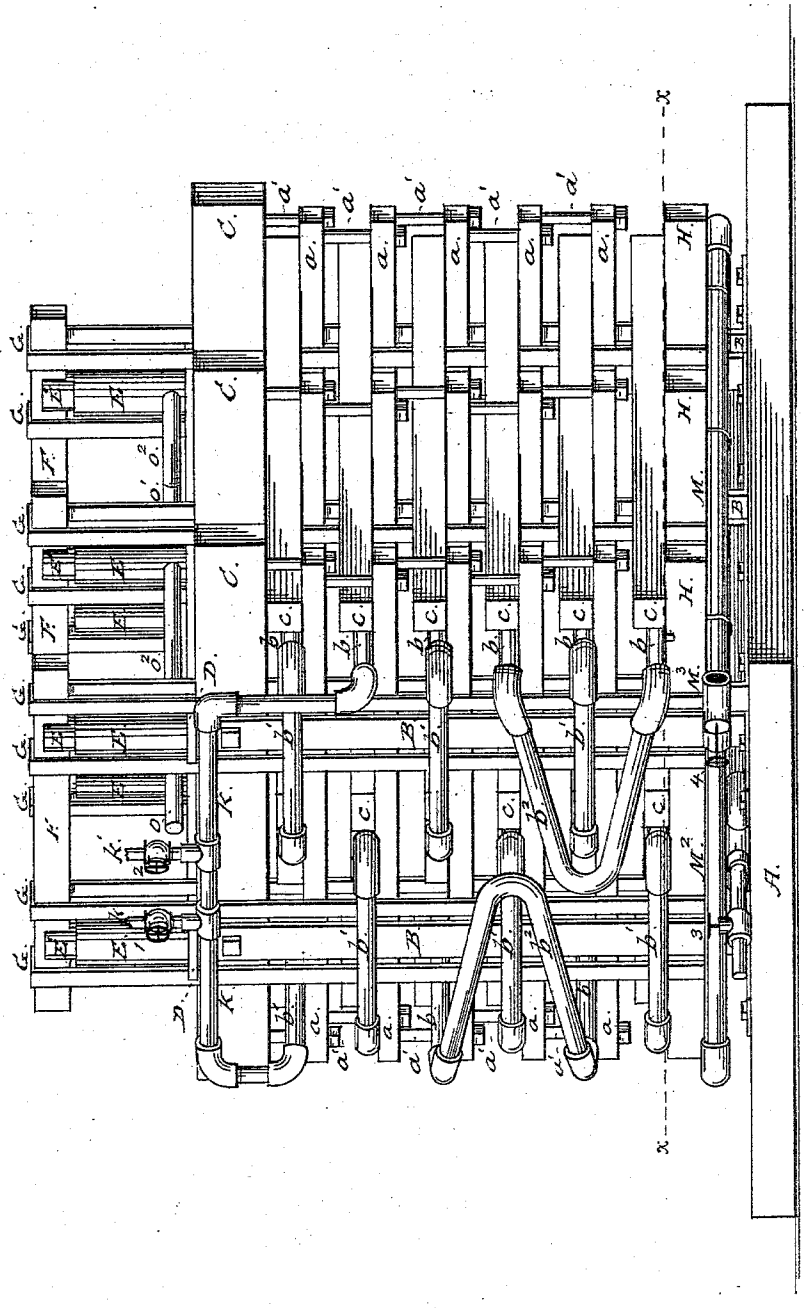

Fig. 1.

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(No Model.) 4 Sheets—Sheet 2.

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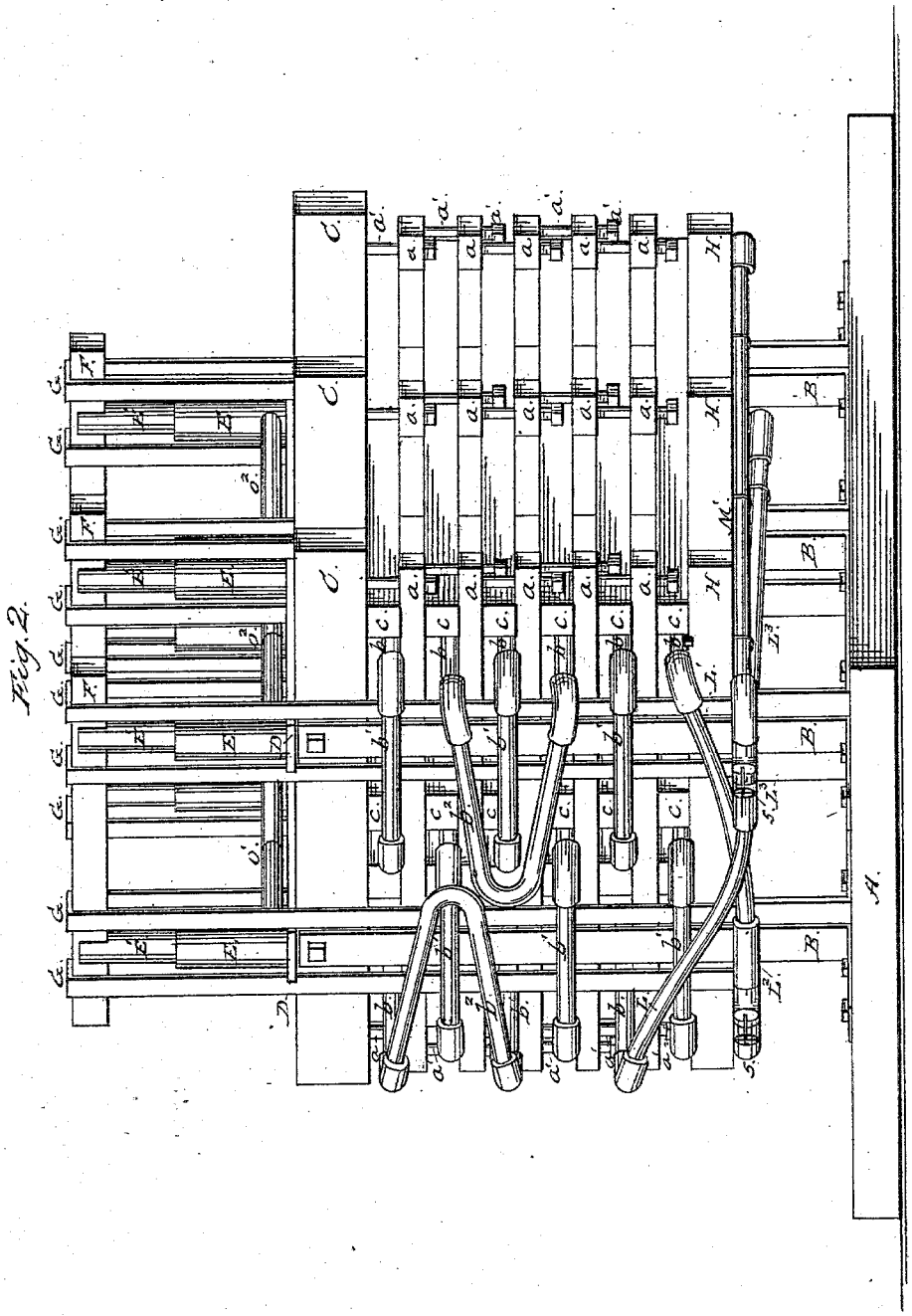

Fig. 2.

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Fig. 3.

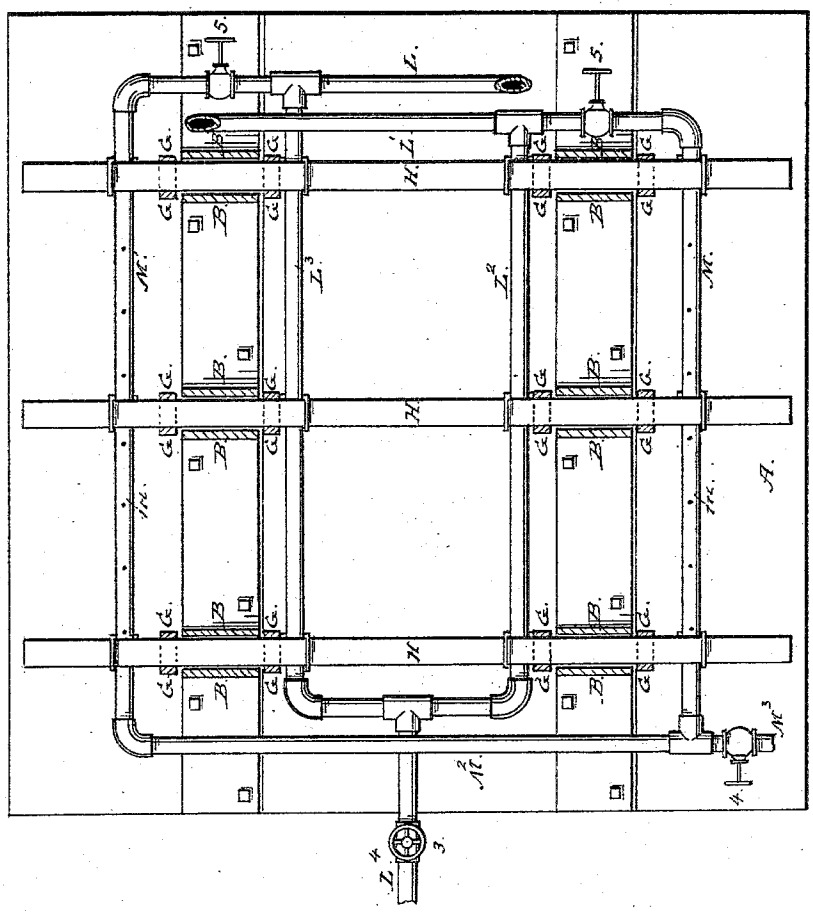

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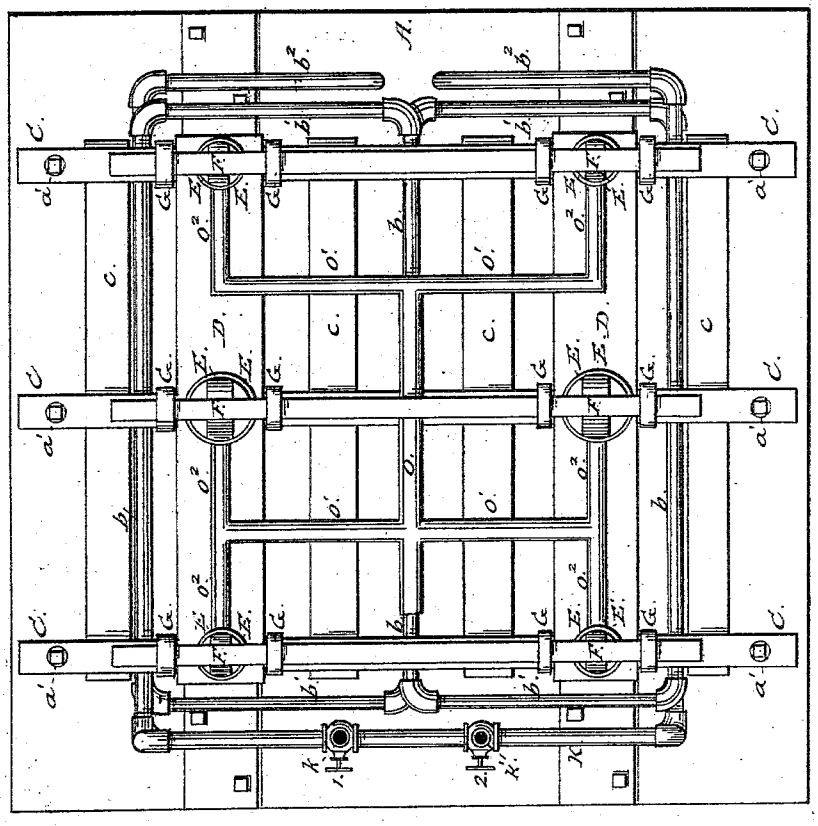
Fig. 4.



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UNITED STATES PATENT OFFICE.

DAVID F. NOYES, OF LEWISTON, MAINE.

LUMBER-DRIER.

SPECIFICATION forming part of Letters Patent No. 286,552, dated October 9, 1883.

Application filed April 6, 1883. (No model.)

To all whom it may concern:

Be it known that I, DAVID F. NOYES, of Lewiston, in the county of Androscoggin and State of Maine, have invented a new and useful Improvement in Apparatus and Process for Seasoning Wood; and I do hereby declare that the following is a full and exact description of the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

My invention relates to a new and useful improvement in apparatus and process whereby hard lumber can, in a comparatively short time and at little expense, be so treated that it will be in condition for immediate use for all mechanical purposes, and superior in all respects to the lumber or wood treated or seasoned by any other apparatus or process hitherto employed.

It is a well-known fact to those familiar with the various modes and apparatus adapted to the artificial seasoning of lumber that heretofore it has been impossible to season the lumber and avoid its being surface-checked and honey-combed to a lesser or greater extent, and, further, that this surface-checking and honey-combing greatly decreases the commercial value of the lumber, rendering it practically unfit for the many and varied uses to which it is specially adapted.

The object of my invention is to treat the lumber in such a manner that the seasoning is thoroughly done and the objectionable features of surface-checking and honey-combing obviated.

A further object of the invention is to provide a suitable apparatus whereby this desired treatment of the lumber can be accomplished in the shortest possible time and with the most satisfactory results.

All lumber shrinks more or less in being seasoned, and the fact that this seasoning has not heretofore been accomplished by artificial treatment in such manner as to allow the lumber to shrink uniformly and regularly throughout its entire area is the prime cause of what is termed "honey-combing" and "surface-checking." In seasoning lumber artificially it becomes necessary to raise the temperature of the wood to a degree that will be sufficient to cause the sap therein contained to be vaporized and be given off at the surface in vapor form. Owing to the fact, however, that the application of heat has to be made from the outside, it necessarily follows that when the interior or center of the wood has reached a temperature sufficient to effect vaporization of the sap the surface has been heated to such a degree as to become comparatively dry, and, as this drying causes shrinking of the wood at this point, the result is the formation of a dry hard shell inclosing the unseasoned portion, which retards the passing off of the vaporized sap, and consequently checks additional shrinking toward the center to such a degree that the wood is unevenly affected by the expansion of the confined heat, and thus caused to season in such shape as to make splits or breaks in the fibers of the interior portion of the wood, thereby producing honey-combing or internal checking. Now, if the drying at the surface can be checked as soon as the temperature of the interior is raised sufficiently to effect the vaporization of the saps, it will readily be seen that the interior of the wood will commence to season as rapidly as the exterior, and that its tendency to shrink will not be confined at first to one point, but, to the contrary, will be evenly distributed throughout the entire area, allowing the wood to be dried uniformly from the center to the surface, and thereby avoiding all danger of honey-combing.

That hard-wood lumber of a thickness varying from two to six inches will become well seasoned in three or four years, and be free from checks and honey-combs, is well known, provided the lumber is not exposed to change of temperature and to drafts or currents of air. This is because the operation of seasoning is gradual and uniform. In my process I purpose to follow nature in this respect, but to so accelerate the operation of drying that the lumber will be thoroughly seasoned in as many days as years are required by nature's process. To accomplish this I first raise the temperature of the lumber to about 225°, in order to start quick vaporization of the saps, then, shutting off the heat-supply, I check the surface-drying suddenly by the agency of cold water, and after the internal heat has abated repeat the operations until the lumber is thor-

oughly dried, when it will be found in every respect equal to that seasoned by the natural slow process and entirely free from honeycombing and surface-checking. Therefore my process, broadly stated, consists in subjecting the lumber to a heat sufficient to cause quick vaporization of the saps, then shutting off the heat-supply, suddenly checking the surface-drying, and after the internal heat has abated repeating said operations until the wood is thoroughly seasoned.

In carrying out my process or method I preferably make use of an apparatus which I will now fully describe, reference being had to the accompanying drawings, which form a part of this specification, and in which—

Figure 1 is a view of my improved apparatus, showing one end and side in elevation, and representing the apparatus opened to receive the lumber. Fig. 2 is a view showing the opposite end and side in elevation, and representing the apparatus closed with the lumber inserted. Fig. 3 is a sectional plan view taken on the line *x x* in Fig. 1, and Fig. 4 is a top plan view of the apparatus.

Similar letters denote like parts throughout all the views.

Referring to the drawings, A represents any suitable foundation for supporting the operative parts of the apparatus. Upon said foundation, and secured firmly thereto, are the vertical standards or supports B, &c., which are arranged in groups of two supports each, as shown. These supports are of sufficient length to accommodate the working capacity of the apparatus, while their arrangement should be such as to have the several groups placed at equal distances apart, and preferably about four feet.

Between the inner faces of the supports in each group in one direction, and to the upper ends thereof, are firmly secured cross-pieces C, the latter being arranged parallel to one another and in the same horizontal plane, as shown. Running transversely to these and resting thereon are binding-pieces D, the latter being arranged directly over the groups of supports B, and having a sufficient width to accommodate the hydraulic lifting devices designed to be used with the apparatus, and which are represented in the drawings by the letters E, &c. A more full description of these will be found in a subsequent part of the specification.

Upon the heads of the plungers E′ of the hydraulic lifters are placed cap-pieces F, the latter running in line with and directly above the cross-pieces C. These cap-pieces are each provided with bridles or long links G, the latter passing over said cross-pieces and outside the cross-pieces C, and being of sufficient length to have their lower ends about six inches above the foundation A. The links G are arranged in sets of two for each hydraulic lifter, there being one upon either side, as shown. Cross-pieces H, running in line with the cross-pieces C, and arranged between the inner faces of the supports to which the cross-pieces C are secured, rest within the lower ends of the links G, and by their agency are supported from the cap-pieces F, as shown.

By consulting Figs. 1 and 2 of the drawings, it will be seen that while that part of the apparatus represented by letters B, C, and D is stationary, the part represented by letters F, G, and H is supported by the hydraulic lifting devices, and by their agency adapted to be raised vertically and independently of the said stationary part. The reasons for this construction will be clearly understood when taken in connection with the description of other operative parts of the apparatus.

To the under side of each cross-piece C, by bolt-and-nut connection, is secured an iron rod, *a*, while beneath each of these, and adjustably secured thereto by a sliding bolt-and-nut connection or equivalent means, is suspended another similar rod, and to this another, and so on until the desired number is suspended one beneath the other in a connected series, and the last course or set of rods rests upon the cross-pieces H, which form the base of the movable part of the apparatus. The relative distance between any contiguous courses of the rods is regulated by the thickness of the lumber to be seasoned, and for boards should be about two and one-fourth inches, while for thicker lumber the distance should be increased accordingly. The rods should be about five-eighths inch square for inch lumber and have the connections made with one another at about four feet apart. The connections are represented by the letter *a′*. The rods *a* are designed to support the pipes through which the steam and cold water will be passed for treating the lumber. These pipes (represented by letters *b*) are arranged transversely to the rods *a*, and about eight to twelve inches apart, or at such distance as to have about one square foot of heating-surface to every cubic foot of space. There should be an odd number of the pipes to each course of rods, and they should be arranged directly under each other in the courses, while their length should be such as to allow connection to be made between their ends outside the outer supporting-rods and the groups of supports B, between which said rods are located. Then the pipes comprising the first or upper course are connected at their opposite ends by means of elbows fitted thereon and united to one another by a right-and-left nipple, as *b′*, the said connections being made in alternate order, and in such manner as to leave one end of each the outside pipes open at diagonally-opposite corners of the course. The second course of pipes is connected in a similar way; but the alternate order should be such as to have the open ends of the outside pipes diagonally opposite the open ends of the pipes in the preceding course. The pipes of the third course are connected in the same order as the first, the fourth as in the

second, and so on throughout the entire number of courses. Then, to connect the courses into a series, the open ends of the pipes in the first and third, second and fourth, and so on, in alternate, for all the courses, are united by means of elbows and the U-shaped pipes b^2, the latter extending laterally toward the center from each side of the apparatus, and preferably being about three feet in length from their bend to where they connect with the pipes *b*. The pipes b^2 are sufficiently flexible to accommodate the movements of the pipes *b* and their supporting-rods in the necessary operations of the apparatus. The object of having the courses of pipes connected into a series in the manner set forth will be explained hereinafter.

Between the pipes *b* in every course, and likewise resting transversely on rods *a*, are arranged the "stickings" *c*, which are made of hard wood and about one-fourth of an inch thicker than the diameter of the pipes. These stickings are adapted to support the lumber when placed between the courses of pipes for seasoning, and serve to keep the weight of the lumber from off the pipes as well as its outside surface from contact therewith.

On one side of the apparatus (see Figs. 1 and 4) a pipe, K, is arranged so as to have one end connect with the open end of the outside pipe, *b*, in the first course at one corner, while its other end connects with the outside pipe of the second course at the corner opposite. Pipe K communicates with the steam-generator and cold-water supply through pipes *k k'*, the latter being preferably located as shown, and provided with stop-cocks Nos. 1 and 2, so that the desired communication may be made or closed as the occasion requires. On the other side of the apparatus (see Figs. 2 and 3) escape-pipes L L', leading from the outside pipes in the two last courses of the series, extend downward and connect with pipes L^2 L^3, the latter being arranged underneath the cross-pieces H, and extending to the opposite side of the apparatus, where they communicate with a pipe, L^4, which has an outlet regulated by a suitable stop-cock, as No. 3. The escape-pipes L L' also communicate with pipes M M', which are arranged underneath the cross-pieces H, and parallel with pipes L^2 L^3, with a space of about two feet between any two of the said pipes. The pipes M M' are provided with perforations *m*, and communicate with a pipe, M^2, which is arranged on the opposite side of the apparatus, and connected with a pipe, M^3, leading to the steam-generator, and provided with a suitable stop-cock, as No. 4. Suitable stop-cocks, as No. 5, are also provided in the connections between the escape-pipes L L' and these perforated pipes, in order that communication between them may be made or closed, as occasion requires. The pipes L^2 L^3 and M M' are secured to the cross-pieces H in any suitable manner, so as to rise and fall with the motions of the movable part of the apparatus.

From the preceding description, taken in connection with the drawings, it will be observed that suspended from the stationary part of the apparatus is a connected series of six courses of pipes, supported one beneath the other, in horizontal planes and at equal distances apart.

It will be observed, further, that connecting the different courses, so as to communicate alternately with one another, and having the main supply-pipe connecting directly with the first and second courses, respectively, enables the distribution of steam and cold water to be made through the series with great rapidity, thereby insuring a quick heat throughout the entire mass of lumber, as well as enabling the surface-drying to be checked suddenly by the introduction of water through the same series of pipes.

It will be observed, further, that the arrangement of the pipes with their stop-cocks underneath the entire series of pipes *b*, and the manner of their connection with said series and with the steam-generator, enables communication to be made or closed between all of said parts; or, with the perforated pipes and their supply-pipe M^2 taken separately, live steam can be introduced from the generator into the perforated pipes, and, passing out through the perforations *m*, be utilized to soften the surfaces of the lumber preparatory to the application of my regular process.

It will be observed, further, that if the movable part of the apparatus be raised by the hydraulic lifters the operation will cause all the courses in the series except the first to be raised, with their supporting-rods, one by one, until the whole number is brought in close contact, and that if the spaces between the courses of pipes be filled with lumber said operation would raise both the lumber and pipes, bringing the latter in contact with the upper face of each layer of lumber, while its lower face rests upon the stickings *c*, as heretofore described.

Although only six courses of the pipes *b*, with their supporting-rods, are represented in the drawings, it will of course be understood that any number of them may be employed, according to the desired capacity of the apparatus.

The hydraulic lifters referred to heretofore are of ordinary construction, but their relative sizes, as well as their arrangement with one another and with their main supply-pipe, are special points of improvement, which I will now describe.

By consulting Fig. 4 of the drawings, it will be seen that these lifting devices (represented by the letter E) are arranged in a group of six, (this being the necessary number for an apparatus eight feet square,)—that is to say, there are two lines of the lifters at equal distances apart, running across the apparatus, and each line contains three lifters at equal distances from each other. It will also be seen that two

lines, or two-thirds of the entire group, are located at the extreme sides of the apparatus, and consequently each lifter in these lines has only about one-half as much weight to raise as those in the other lines. Therefore, in order to secure a uniformity of pressure and prevent the outside portions of the lumber from being raised more rapidly than other portions, the outer lines of lifters are reduced in size, so that their lifting capacity will be only about one-half that of each of the lifters in the interior line.

The water for operating the lifting devices is taken from a main supply-pipe (not shown) arranged at one side of the apparatus, through a pipe, O, which extends centrally across the top of the apparatus. Branch pipes O′, leading between each set of lifters on either side, connect with pipe O, and, by means of additional branch pipes, O^2, are also connected with each lifter, respectively, in each set, so that the entire group is in direct communication with pipe O, as shown. This pipe is provided with a stop-cock near its point of connection with the main supply-pipe, and thus the admission of water to operate the lifters is regulated at one point and the entire group uniformly furnished with the necessary motive power from the single main supply-pipe.

With this general description of the apparatus, I will now explain how the same should be operated in order to practically and successfully carry out my improved method of seasoning hard-wood lumber.

When the apparatus has been filled with the lumber, which is accomplished by inserting it horizontally between the several courses of pipes *b*, and the pipes brought in close proximity therewith by the agency of the hydraulic lifting devices, then open stop-cock No. 4 and permit free steam to issue from the perforated pipes N N′, &c., for twenty or thirty minutes, or until the lumber is sufficiently moistened to open the pores and soften the surface. Then open stop-cock No. 1 and admit steam through the entire series of pipes *b* and allow the heating of the lumber thereby to continue for about two hours and under a temperature of about 225° to 250°, bearing in mind to close stop-cock No. 4 shortly after the steam for heating the lumber is fairly distributed through all the courses of pipes *b*. After the heating has continued for the desired period of time, then close stop-cock No. 1, and, opening stop-cock No. 2, allow cold water to be introduced through the same series of pipes, *b*, continuing the flow for about thirty minutes, or until the temperature of the lumber at the surface is reduced to or a little below 100°. Then close stop-cock No. 2 and repeat the heating and cooling operations in consecutive order and for the given times until the vaporized sap ceases to appear at the exposed ends of the lumber, when the same will be in a thoroughly-seasoned condition, and may be removed from the apparatus.

Above I have given the time usually required for raising the temperature of the wood, as well as for reducing its temperature at the surface. I have also stated what degrees of heat and reduced temperature are generally necessary in order to obtain the best results by my mode of treating lumber; but I do not mean to confine myself to them, for it is obvious that under some conditions differences in time and in the degree of heat and temperature may suggest themselves without departing from the spirit of my invention. I have, however, given units of time and temperature with sufficient definiteness to enable skilled operators to use and work my invention.

By the use of my apparatus and process, wood or lumber which requires from one to six or more years to season in the open air is so changed by the treatment in a few hours, and without warping, cracking, or injury to the fiber, that it is in suitable condition to be used for all purposes.

Modifications in details of construction may be made without departing from the principle or sacrificing the advantages of my invention, the essential features of which will readily be understood from the foregoing description, taken in connection with the drawings; hence I reserve to myself the right to make all such changes and alterations as may properly fall within the scope of my invention.

Having fully described my invention, what I claim is—

1. The herein-described process of treating and seasoning wood, which consists in subjecting the wood to a heat sufficient to vaporize the saps, then shutting off the heat-supply and suddenly subjecting the external surfaces of the wood to a cooling influence, to avoid on such surfaces the formation of a shell which would otherwise prevent the evaporation of the saps, as set forth.

2. The herein-described process of treating and seasoning wood, consisting in subjecting the wood to a heat sufficient to cause quick vaporization of the saps, then shutting off the heat-supply, suddenly reducing the temperature of the wood at the surface sufficiently to avoid drying at that point, and, after the internal heat has abated, repeating the operations in consecutive order until the saps have been entirely vaporized and passed off at the surface, all substantially as and for the purposes set forth.

3. The herein-described process of seasoning wood, which consists in raising the temperature of the wood sufficiently to effect vaporization of the saps by subjecting it to the action of heat by passing steam through pipes in close proximity thereto, then reducing its temperature at the surface by passing cold water through the same series of pipes, substantially as and for the purposes set forth.

4. As a means for seasoning wood artificially, substantially as described, a series of pipes, a steam-generator, and a cold-water supply,

combined with suitable connections, whereby steam or cold water may be projected through said pipes at will, or as occasion requires, as set forth.

5. A lumber-seasoning apparatus provided with a series of courses of pipes supported one beneath the other in horizontal planes, and connected together in alternate order, substantially as and for the purposes set forth.

6. A lumber-seasoning apparatus provided with a series of courses of pipes adjustably supported in horizontal planes one beneath the other, and flexibly connected together in alternate order, substantially as and for the purposes set forth.

7. A lumber-seasoning apparatus provided with a series of courses of rods adjustably connected together in horizontal planes one beneath the other, and having a series of courses of pipes supported by the said series of rods, and flexibly connected together in alternate order, substantially as and for the purposes set forth.

8. A lumber-seasoning apparatus provided with an alternately-connected series of courses of pipes supported one beneath the other in horizontal planes, and having perforated pipes arranged underneath the said series of pipes, and connecting therewith and with the steam-generator, as and for the purposes set forth.

9. A lumber-seasoning apparatus provided with a group of hydraulic lifting devices of variable sizes, and so arranged with relation to one another that the ones at the center shall have a lifting capacity equal to about double that of those at the sides of the apparatus, as and for the purposes set forth.

10. A lumber-seasoning apparatus provided with a group of hydraulic lifting devices of variable sizes, arranged substantially as shown, and so connected with the main supply by means of suitable branch pipes as to have the entire group operated simultaneously and the motor power therefor controlled at one point, as set forth.

11. A lumber-seasoning apparatus provided with the following elements: a main supply-pipe connecting, respectively, with the steam and cold-water sources, and provided with stop-cocks, as shown, and a series of courses of pipes, as *b*, suspended one beneath the other in horizontal planes, as set forth, the said courses being connected alternately, and the series of courses being connected with the main supply-pipe at points distant from each other, whereby the steam or water may be rapidly distributed through the entire series of pipes, as specified.

12. In a lumber-seasoning apparatus, substantially as described, and in combination with a series of pipes arranged in horizontal courses flexibly connected together in alternate order, and supported one beneath the other, as set forth, a stationary frame, a movable frame, and means, substantially as described, for elevating the latter, whereby the said courses of pipes are enabled to be brought in close proximity with the lumber to be seasoned, as set forth.

13. A lumber-seasoning apparatus provided with the following elements: a main supply-pipe connecting, respectively, with the steam and cold-water sources, the connecting-pipes having suitable stop-cocks, an alternately-connected series of courses of pipes suspended in horizontal planes one beneath the other, the first and second courses, respectively, of the series connecting with said main supply-pipe, perforated pipes arranged beneath the entire series of suspended pipes, and connecting therewith and with the steam-generator, the connections having suitable stop-cocks, a group of hydraulic lifting devices of variable sizes, connecting with one another and with a single main supply-pipe, and a stationary and movable frame, and all arranged to serve as and for the purposes set forth.

14. In combination with the perforated pipes M M′ and the waste-pipes L^2 L^3, the connecting-pipe M^2, leading to the steam-generator, and the stop-cocks 4 and 5, for controlling the steam employed in said perforated pipes, as set forth.

15. In combination with the rods *a*, supported as described, and the pipes *b*, supported on said rods and running transversely thereto, a series of stickings, as *c*, supported also by the same rods and arranged parallel with and between each adjacent pair of pipes, and adapted to support the lumber to be treated, as and for the purposes set forth.

This specification signed and witnessed this 6th day of April, 1883.

DAVID F. NOYES.

Witnesses:
C. S. DRURY,
WM. O'BRIEN.