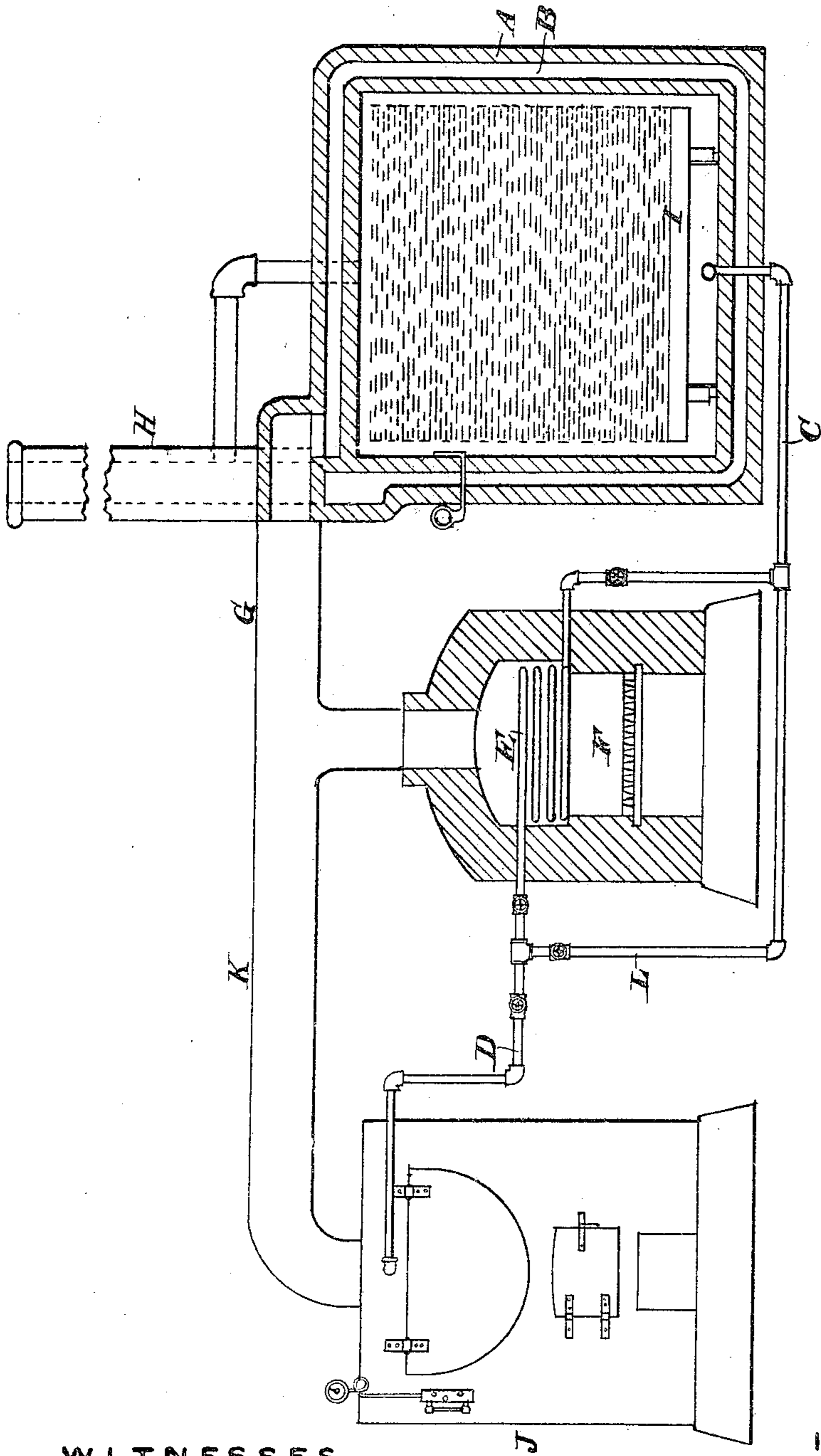


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METHOD OF DRYING AND TREATING LUMBER.  
APPLICATION FILED APR. 30, 1907.

903,635.

Patented Nov. 10, 1908.



WITNESSES.

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# UNITED STATES PATENT OFFICE.

ANTON J. UPHUS, OF SEATTLE, AND NELSON J. CHAPMAN, OF EVERETT, WASHINGTON.

## METHOD OF DRYING AND TREATING LUMBER.

No. 903,635.

Specification of Letters Patent.

Patented Nov. 10, 1908.

Application filed April 30, 1907. Serial No. 371,043.

*To all whom it may concern:*

Be it known that we, ANTON J. UPHUS and NELSON J. CHAPMAN, citizens of the United States, and residents, respectively, of the city of Seattle, in the county of King and State of Washington, and of the city of Everett, in the county of Snohomish and State of Washington, have invented certain new and useful Improvements in Methods of Drying and Treating Lumber, of which the following is a specification.

Our invention relates to an improvement in methods of drying and treating lumber, and comprises the novel steps which will be hereinafter described and particularly pointed out in the claims.

The object of our invention is first; to hasten the drying of the lumber; second, to improve its physical properties and appearance, as for instance, by suppressing, or decreasing the tendency to check, mildew, warp and split. Third: to modify the character of the components of the lumber, as, for instance, is shown by its action upon resinous lumber, whereby subsequent exudation of pitch and rosin is suppressed. Fourth, to provide a process and an apparatus which will secure the before-mentioned results and be economically and commercially practicable for the handling of commercial sizes of lumber in commercial quantities.

Other objects of our invention will appear from a study of the specification and claims.

In the accompanying drawings we have shown one form of apparatus by which we may carry out our invention, the same being such as we now prefer to use. Our invention may, however, be carried out by the use of various other forms of apparatus.

The drawing shows in elevation and partial section the form of apparatus now preferred by us.

By the process of kiln drying lumber which is universally employed, namely that employing air heated by radiation, usually employing as a heating medium steam confined within pipes, the time required to finish the process is usually about 72 hours for one inch lumber. The lumber when dried by this process usually contains a percentage of pieces which have been cracked, warped or season checked by the drying process, thereby having its quality and value much lowered, resulting in an appreciable loss which is directly attributable to the drying process.

The percentage of loss will vary with circumstances but averages close to 8%. One of the factors largely affecting this is the temperature employed and the time consumed in the drying process. A high temperature and a short drying period increases such losses. A temperature in the kiln approaching or exceeding 200° F. will cause much checking, warping and splitting of the lumber.

We have discovered and demonstrated that by using as the heating agent, highly superheated steam at atmospheric pressure in direct contact with the lumber to be dried, we can safely use temperatures far exceeding those usually employed and perfectly dry the lumber in a time far shorter than the least time essential by the old process. At the same time the condition of the lumber is improved in that the checking, warping and splitting which accompanies kiln drying by the usual process is practically eliminated, thus avoiding a source of serious loss.

We are aware that steam having a certain measure of superheat has been employed as an agent for the treatment of wood products which are to be dried, and also that steam at temperatures approximating 300° F., but under a corresponding pressure, has been used for drying wood. Neither of these is however the equivalent of our process, which involves high degrees of superheat associated with substantially atmospheric pressure. The pressure process is manifestly impractical on a commercial scale, as this means the handling of large sizes of lumber in large quantities. To make a kiln of size sufficient to take in commercial sizes of lumber on cars such as are now used, it would be practically impossible to give them the strength necessary to withstand the pressure. The cars used for handling the lumber will run to as large a size as 9 ft. wide, 12 ft. high and 32 ft. long. It would be still more impossible to provide doors strong enough to hold such pressures and to remain tight under pressure.

The kiln employed by us is a plain chamber not necessarily steam tight of any suitable construction without any steam pipes or other like radiating surfaces for providing and maintaining the required temperature. It is preferable that the kiln be so constructed as to conserve the heat by prevention of radiation losses. One way of doing

this is that shown in the drawings which consists in providing the walls A with flues B through which are passed the waste gases of combustion coming from the furnace F of the superheater or from any other source. The object of this is, not to provide a radiation surface to heat the contents of the chamber, but to reduce the condensation of steam upon the walls. We prefer to make the kiln of reinforced concrete. It is not however, necessary to provide strength to resist an internal pressure, as this is at all times at or near atmospheric.

The steam is derived from any convenient source; it may be obtained directly from a boiler capable of itself superheating the steam, or from an ordinary boiler, or be the exhaust steam from a steam engine. We have shown it as derived from a boiler J. If not otherwise superheated, the steam is first passed through a superheater of any suitable construction where it is highly heated and is then discharged directly into the kiln where it comes in direct contact with the lumber.

The superheater shown in the drawings consists of a furnace F having pipes E in which the steam is superheated. The steam is supplied thereto through the pipe D and is conducted therefrom to the kiln through pipe C. The waste gases of combustion from the furnace are conducted through the flue G to the flues B of the kiln wall, and are finally discharged through the chimney H.

We have shown a by-pass L by which steam from the boiler may be introduced into the kiln without passing it through the superheater.

In carrying out our process we heat the steam far above the temperatures usually employed. At times, in the course of our work, the temperature of the steam when introduced into the kiln has been sufficient to heat the pipe to a bright cherry red. This does not, however, heat the lumber up to any such temperature.

In operating our kiln the following is what usually occurs, as near as our facilities have enabled us to determine. In starting with a cold kiln the temperature indicated by a thermometer placed close to or against the lumber quickly rises to about 120° F. This temperature rises gradually until after about one half hour it is at or near boiling point, 212° F., from which point the rise is gradual for about two hours when it has reached a temperature of approximately 250°, after which it rises until it reaches 300° or probably higher before the process is finished. Our method of determining these temperatures has been to insert a thermometer within an iron pipe which projects through the walls into the kiln. There is a variation of temperature depending upon location. With steam introduced at the bot-

tom of the kiln the bottom temperature will be from 10° to 20° higher than above the lumber.

The time usually required for completing the drying process has been from six to ten hours from the time of putting the lumber in the kiln. This time will vary with the size of the kiln, the thickness of the lumber, the temperature of the steam, etc. The figures given were obtained in operating a kiln which was 7 feet high, five feet wide and thirteen feet long, inside dimensions. The degree of super heat in the steam used was not measured for lack of suitable instruments, but it was evidently high as at times the steam supply pipe reached a cherry red. This does not, however, mean that the lumber being dried reached any such heat. The lumber being relatively cold at first condenses the steam upon its surface and in all probability the maximum temperature of the lumber thereafter was from 250° to 325° F. We have not found it necessary to provide any special after-step to dry the moisture from the surface of the lumber, as but little forms and the heat of the lumber and the kiln is sufficient to evaporate this.

In our experiments we have run the temperature to such a height and continued it for such a time that the lumber upon removal had a slightly brownish surface tinge, without the lumber being injuriously affected in the least. The process and results obtained are very different from those when a moderate or slight superheat is used. Our process involves the use of what would ordinarily be called an excessive degree of superheat. Moreover it is all done at atmospheric pressure and therefore does not require especial strength of kiln or tightness of joints. Our experiments have been conducted upon green Douglas fir. The lumber when inserted was strictly green and upon removal was thoroughly dried entirely through. The loss of weight was from 20% to 30% of the green weight. The time required is from six to ten hours in contrast with about 72 hours by the common process. The pitch and rosins are so thoroughly "killed" or suppressed, that any amount of subsequent heating will not bring out any more rosins. To the best of our knowledge this result has never before been obtained by any process of treatment.

The treatment must be varied somewhat with the character of the lumber. If it is slash grained the temperature should be raised somewhat slower, or there is a possibility of cracking and of splitting the lumber.

By the term lumber as herein employed we mean to include any and all wood products.

What we claim as our invention is:

1. The herein described process of treat-

ing lumber which consists in drying the same in an atmosphere of super-heated steam, at substantially atmospheric pressure.

2. The herein described process of treating resinous lumber which consists in drying it in an atmosphere of steam at substantially atmospheric pressure and super heated to a temperature sufficient to expel the turpentine and like oils which are solvents of the resins.

In testimony whereof, we have hereunto affixed our signatures this 24th day of April, 1907, in the presence of the two subscribing witnesses, at Seattle, Washington.

ANTON J. UPHUS.  
NELSON J. CHAPMAN.

Witnesses:

L. A. POWELL,  
H. L. REYNOLDS.