

United States Patent Office.

JOSHUA R. HAYES, OF WASHINGTON, DISTRICT OF COLUMBIA.

Letters Patent No. 107,904, dated October 4, 1870.

IMPROVEMENT IN PRESERVING WOOD.

The Schedule referred to in these Letters Patent and making part of the same.

To all whom it may concern:

Be it known that I, JOSHUA R. HAYES, M. D., of Washington city, in the county of Washington and in the District of Columbia, have invented certain new and useful Improvements in Rendering Woody Fiber More Durable and Insusceptible to Decay; and do hereby declare that the following is a full, clear, and exact description thereof.

The nature of this invention consists in making wood insusceptible to the influence of heat and moisture, and thereby increase its durability.

To accomplish this result, reference should be had to the chemical nature of wood, and the effect of chemical agents upon its fiber.

Many ways have been suggested to impregnate the pores of wood with agents that will make it not liable to decay. All of these ways prove ineffectual, for the reason that the substances employed do not thoroughly permeate the woody fiber and pores of the wood, and those which do act upon the wood do so mechanically only.

No process is used to form chemical combinations with the fiber of the wood, by reason of chemical affinity of the materials used with the woody fiber.

To form a new substance in the wood, as the effect of a chemical agent upon the lignine and cellulose, and thus render the more delicate structure of the wood durable, is the object of this invention.

The wood to be treated in the way presently to be described, is placed in an air-tight iron chamber, of sufficient capacity to hold the quantity desired, which chamber is connected, by means of a conduit or pipe, to a retort, also of sufficient capacity for the purpose.

In this retort I place tannic acid, or any substance containing this acid, as sumac bark, &c., saturated with sufficient water to generate steam.

When heat is applied to the retort containing this acid, the steam produced passes through the conduit or pipe into the air-tight chamber containing the wood, which becomes in a little time impregnated with the vapors containing tannin, which, in the condition of vapor, as can be readily understood, permeates thoroughly the wood, drives off surface moisture, and chemically acts upon the gelatinous, albuminous, and nitrogenous lignine and cellulose composing the body of the wood, and forms a substance of a leathery nature, similar to that produced upon the skins of animals by the use of tannic acid, in the well-known process of tanning hides.

The most characteristic feature of tannic acid is that it forms insoluble compounds with organic matter. It is upon this principle that leather is manufactured.

When we see that the lignine and cellulose in wood

is composed of organic matter, gelatinous or albuminous in nature, the action of tannin upon it, when brought in contact with it, must produce a new compound in the wood similar to that of leather. The structure of the wood being thus rendered of a leathery nature its durability must necessarily be increased.

In former times, when mills were run with wooden wheels, it was customary, before gearing said wheels, to boil them in a tank containing oak bark and water, for the purpose of hardening them. This hardening was due to the tannin in the bark, as will be apparent. But to treat wood on a large scale in this way is impracticable; but the practicability of steaming wood with vapors containing tannin is made evident, as all the tannin is utilized, and the expense attending the process merely nominal.

Steam vapors, from substances that are antiseptic in nature, have been used for impregnating the pores of wood, as those from tar containing carbolic acid, creosote, &c., but, as these act only mechanically, no chemical union producing a new substance in the wood is had.

The employment of tannin, or any substance containing this agent, will, however, as before stated, form a chemical union with the albuminous lignine and cellulose in the wood, and that portion of it is thus rendered of a leathery and insoluble nature.

Again, the heat necessary (equivalent to superheated steam) to generate vapors containing carbolic acid, creosote, &c., will of itself destroy the delicate fibers of wood, and more injury than benefit is the result from such impregnation.

In fact, the employment of superheated steam, (whether from water alone or substances containing carbolic acid, &c.) to dry the wood by driving off the moisture within it, is of questionable utility, as it must be apparent to all conversant with the structure of the lignine and cellulose, that these substances are of a delicate nature, incapable of sustaining, without injury, the action of superheated steam upon them; but, if the lignine and cellulose in the wood, in the first place, be treated in the manner I have stated, these delicate structures are rendered insoluble and of a leathery nature, and then the wood, as a second step, is prepared for the introduction of superheated steam and antiseptics at a high temperature, to drive off all moisture and to fill up the pores of the wood without injury to the fiber.

It is a well-known fact in chemistry that while tannin is by itself soluble in cold water, it is not soluble in boiling water. It is a fact, however, equally well established that tannin is soluble in boiling water with the addition of soda, and is then, as a natural consequence, vaporizable, and, on cooling, separates into the shape of a powder that is permanent.

Potash and ammonia, also, dissolve tannin in boiling water, but the latter is more soluble by the addition of soda.

In the process herein described, soda is, therefore, added to the tannin, or its allied compounds, to render it soluble under heat and, hence, vaporizable.

I disclaim any novelty in the process of introducing vapors from steam containing antiseptic agents, as carbolic acid, creosote, &c., that act mechanically only, but confine myself to the employment of agents that form a chemical union with the lignine and cellulose, rendering them insoluble and of a leathery nature, in the way I have described.

Nor do I make any claim of novelty in the employment of superheated steam to drive off moisture from the wood, as this is a process long in use; but

What I claim as novel, and desire to secure by Letters Patent, is—

1. The process of introducing the vapors of tannin, or its equivalent, through the fibers of the wood to be preserved, by means of which a chemical union

is effected with the gelatine of the wood, thereby rendering that portion of the wood of a leathery consistence and, therefore, insoluble, in the manner substantially as set forth.

2. The process of subjecting wood to be preserved to the vapors of superheated steam, to drive off moisture therefrom, in combination with the vapors of tannin, or its equivalent, when the latter is applied as described, to bring the wood to that condition as to receive the vapors of superheated steam without injury, in the manner substantially as set forth.

3. The process described, of the combination of tannin and superheated steam with tarry compounds, to render wood durable and insusceptible to decay, in the manner substantially as set forth.

In testimony that I claim the foregoing, I have hereunto set my hand this 31st day of July, 1869.

J. R. HAYES, M. D.

Witnesses:

J. L. RIDER,

R. F. HUNTER.