

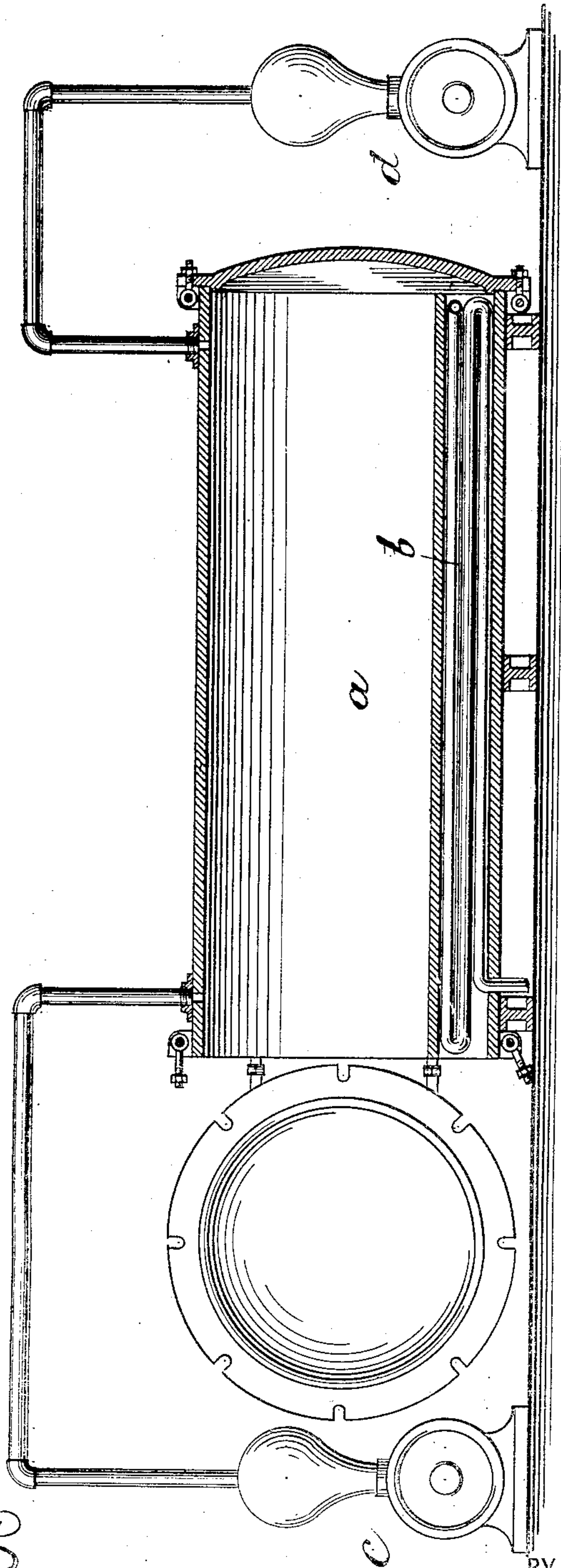
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J. F. GEISLER.
PROCESS OF FIREPROOFING WOOD.

(Application filed Feb. 12, 1900.)

(Specimens.)



WITNESSES:

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JOSEPH F. GEISLER, OF NEW YORK, N. Y., ASSIGNOR TO THE AMERICAN
WOOD FIREPROOFING COMPANY, OF SAME PLACE.

PROCESS OF FIREPROOFING WOOD.

SPECIFICATION forming part of Letters Patent No. 679,739, dated August 6, 1901.

Application filed February 12, 1900. Serial No. 5,034. (Specimens.)

To all whom it may concern:

Be it known that I, JOSEPH F. GEISLER, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented a certain new and useful Process for Fireproofing Wood and other Combustible Substances; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to a process of fireproofing wood and other combustible substances; and it consists in the novel steps of the process employed.

The objects of my invention are to decrease the cost and increase the efficiency of the treatment of wood and other combustible substances for the purpose of rendering them fireproof, to prevent deliquescence of the salts used after they have been applied, and to seal such salts into the pores of the wood in an effectual manner. These objects are attained in the process herein described, an apparatus to be used in carrying out which is shown in the accompanying drawing, forming a part of this specification.

In my process I impregnate the wood or other substance treated with a solution containing one or more ammonium salts, such as ammonium sulfate, phosphate, or tungstate, and also containing casein. I then subject the wood to the action of formaldehyde gas or carbonic acid, which renders insoluble or coagulates the casein, thereby sealing within the pores of the wood the fireproofing salts. In order to neutralize possible acidity of the wood, I subject it to a preliminary treatment with an alkaline reagent, such as ammonia-gas.

In the accompanying drawing, *a* designates a tank in which the timber or other substance to be fireproofed may be placed for treatment. It is adapted to be closed air-tight and is provided with steam-pipes *b*, by which it may be heated. *c* designates a vacuum-pump connected with said tank, and *d* a pump for forcing gases or fluids under pressure into it.

I will describe my process as employed for the fireproofing of timber. The fireproofing

of other substances of a combustible nature may be carried on in the same manner.

Before the treatment of the wood is begun a sample of it is tested to determine the amount of moisture the wood is capable of absorbing. For this purpose it may be placed within a suitable tank and heated therein to a temperature of from 100° to 110° Fahrenheit, a high vacuum being maintained. When the vacuum remains constant for from one and a half to three hours, the tank may be allowed to fill with water, and after the wood has absorbed nearly as much water as it is capable of absorbing without the application of pressure a pressure of from one hundred to one hundred and fifty pounds to the square inch is applied and maintained until the pressure remains constant without further operation of the pump. The wood is then removed from the tank and weighed. If the sample shows an increase in weight within ninety per cent. of what experience shows to be the maximum increase in weight which it is practicable to obtain for the particular variety of wood treated, it is deemed suitable for treatment without steaming; otherwise it must be steamed to some extent at least. For dry white pine an increase in weight of one hundred and eighty-five per cent. is sufficient. The wood to be fireproofed is then placed within the tank *a*, the tank closed, and a high vacuum is produced in the tank by means of the vacuum-pump. A quantity of ammonia-gas or concentrated aqua-ammonia is then drawn into the cylinder and the ammonia allowed to permeate the wood. After a time the vacuum is broken by drawing air through the water containing ammonia and having a temperature of about 130° Fahrenheit, thus charging the rushing air with both moisture and ammonia. When atmospheric pressure has been established in the tank *a* by the admission of air in this manner, steam is slowly passed through the coils *b* to raise the temperature of the contents of the tank to from 120° to 140° Fahrenheit. This temperature and the resulting pressure are maintained for a half-hour or more, according to the size of the timber treated, until the ammonia has penetrated into the heart of the wood. If the preliminary test above mentioned has

shown that the wood requires steaming, steam is introduced into the tank *a* at this point, the temperature in such case rising higher than as above stated. After the treatment with ammonia or ammonia and steam is completed a vacuum is created in the tank, the ammonia-vapors withdrawn while creating this vacuum being collected in any customary manner. When the vacuum remains quite constant, the wood is ready to receive the impregnating solution.

The composition of the impregnating solution which I prefer to employ is as follows: sodium borate, .5 to 1.5 per cent.; ammonium sulfate, ten to fifteen per cent.; sodium sulfate, one to four per cent.; ammonium phosphate, two to six per cent.; sodium phosphate, two to six per cent.; free ammonia, about .1 per cent.; water to make up, one hundred per cent.; casein solution, sufficient to saturate. The casein solution, which, as above stated, is added to the solution containing ammonium and sodium salts, is prepared by dissolving casein and borax in water in the proportion of from four to five ounces of casein and two ounces of borax per gallon of water. The borax is used in the solution as a solvent and preservative of the casein. This solution is added to the solution of ammonium and sodium salts until the casein begins to cloud the solution or until, as known from previous experience, the solution is saturated.

With the above-mentioned impregnating solution I preferably use from .2 to .5 per cent. of an oil emulsion. The oil chosen should be one which is liquid at 90° Fahrenheit, but congeals at a temperature of from 70° to 75° Fahrenheit. Such an oil mixture is easily produced by mixing cotton-seed oil with lard or tallow or by mixing a mineral oil with animal fat or paraffin. I may also use in connection with the impregnating solution and as a water-repellent from .2 to 1 per cent. of a soluble soap, preferably a potassium soap, the fatty acids of which are caused to separate in the dried impregnated wood by the action of carbonic-acid gas or other gas having an acid reaction. These fatty acids act as water-repellents, and therefore serve to prevent water from reaching and so acting upon the fireproofing salts with which the wood is impregnated, and, if desired, the soap may be used instead of the casein.

The impregnation is accomplished by admitting the impregnating solution to the cylinder containing the wood after a vacuum has been produced therein, as above stated, and by applying a pressure of from one hundred to one hundred and fifty pounds to the square inch. This pressure is maintained for a period of from twelve to forty-eight hours, according to the variety and thickness of the wood treated. Twelve hours is usually sufficient for wood an inch thick. When the impregnation is complete, the wood is allowed

to dry and is then subjected to the action of formaldehyde gas or carbonic-acid gas, the wood being first subjected to a vacuum before the gaseous reagent is admitted to it. Formaldehyde gas, if used, renders the casein insoluble, and so causes it to seal the fireproofing salts into the pores of the wood. Carbonic-acid gas, if used, coagulates the casein, and so accomplishes the same purpose. If the impregnating solution contained soap, as above described, carbonic-acid gas may be applied after the formaldehyde treatment to liberate the fatty acids from the soap, or the carbonic-acid treatment may be substituted for the treatment with formaldehyde, in which case the casein is coagulated and the fatty acids are liberated in one operation. Instead of carbonic-acid gas any other gas or vapor having an acid reaction may be used. The treatment with formaldehyde or with carbonic-acid or other acid gas or vapor should be continued for two hours or more, depending upon the thickness of the timber treated.

Instead of employing an impregnating solution containing a number of different salts of ammonium and sodium a solution of a single ammonium salt may be employed in connection with the casein; but a certain mixture of sodium salts with ammonium salts is preferred. Potassium salts may be substituted for the sodium salts, and the process herein described of sealing a fireproofing agent into the pores of the wood by introducing casein and then coagulating it or rendering it insoluble is equally applicable to the sealing into the pores of fibrous substances or other substances, whether fireproofing agents or otherwise.

Having thus completely described my invention, what I claim, and desire to secure by Letters Patent, is—

1. The herein-described method of sealing into the pores of fibrous material substances with which such material is impregnated, which consists in introducing casein into such material, and then rendering the casein insoluble.

2. The herein-described method of sealing into the pores of fibrous material substances with which such material is impregnated, which consists in introducing casein into such material, and then applying a gaseous reagent to render the casein insoluble.

3. The herein-described method of sealing into the pores of fibrous material substances with which such material is impregnated, which consists in introducing casein into such material, and then applying formaldehyde to render the casein insoluble.

4. The herein-described method of applying to fibrous material a water-repellent, which consists in impregnating such material with a solution containing a soluble soap, and then liberating the fatty acid of the soap by the action of an acid.

5. The herein-described method of applying to fibrous material a water-repellent,

which consists in impregnating such material with a solution containing a soluble soap, and then liberating the fatty acid of the soap by the action of a gas having an acid reaction.

5 6. The herein-described method of applying to fibrous material a water-repellent, which consists in impregnating such material with a solution containing a soluble soap, and then liberating the fatty acid of the soap by
15 the action of carbonic-acid gas.

7. The herein-described process of fireproofing wood and other fibrous substances, which consists in impregnating such substance with a fireproofing material and with
15 casein, and then rendering the casein insoluble.

8. The herein-described process of fireproofing wood and other fibrous substances, which consists in impregnating such substance with a fireproofing material, with an
20 oil, and with casein, and then rendering the casein insoluble.

9. The herein-described process of fireproofing wood and other fibrous substances, which consists in impregnating wood with a
25 fireproofing material, with casein, and with a soluble soap, and then rendering the casein insoluble and liberating the fatty acid of the soap.

30 10. The herein-described process of fireproofing wood and other fibrous substances, which consists in impregnating wood with a fireproofing material and with a soluble soap, and then liberating the fatty acid of the soap.

35 11. The herein-described process of fire-

proofing wood and other fibrous substances, which consists in impregnating wood with a solution containing ammonium salts and casein, and then rendering the casein insoluble.

12. The herein-described process of fireproofing wood and other fibrous substances, which consists in impregnating wood with a solution containing ammonium and sodium sulfate, ammonium and sodium phosphate,
45 and casein, and then rendering the casein insoluble.

13. The herein-described process of introducing casein into the pores of wood and other fibrous substances, and fixing the same there-
50 in, which consists in first neutralizing possible acidity of the substance treated with a gas or vapor having an alkaline reaction, applying a solution containing casein, and then rendering the casein insoluble.

14. The herein-described process of fireproofing wood and other fibrous substances, which consists in first neutralizing possible acidity of the substance treated with a gas or vapor having an alkaline reaction, then
60 impregnating such substance with a fireproofing material and with casein, and then rendering the casein insoluble.

In testimony whereof I affix my signature in the presence of two witnesses.

JOSEPH F. GEISLER.

Witnesses:

H. M. MARBLE,
A. H. PERLES.