Patented Aug. 14, 1928. 1,680,529

UNITED STATES PATENT OFFICE.

GEORGE A. RICHTER, WALLACE B. VAN ARSDEL, AND JOHN G. GOSSELINK, OF BERLIN, NEW HAMPSHIRE, ASSIGNORS TO BROWN COMPANY, OF BERLIN, NEW HAMPSHIRE, A CORPORATION OF MAINE.

METHOD OF TREATING WOOD.

No Drawing. Application filed April 8, 1927. Serial No. 182,173.

This invention relates to a method of treating wood, and has for its object to provide an effective and economical method of impregnating wood with fluids. Generally stated, our method comprises displacing the air in the pores and interstices of the wood with a condensible vapor, and condensing such vapor to produce a vacuum in situ in such wood while the wood is enveloped in the desired fluid, thus causing such fluid to be drawn into and throughout the wood.

Our method finds particular advantage in staining or coloring throughout a relatively inexpensive wood to produce a product simulating walnut in appearance. In staining wood, the wood is heated preferably to a temperature of or above 100° C. This causes the free moisture content of the wood to be transformed into steam, which expels and displaces the air in the wood pores and interstices. The wood is then confined while hot, and ammoniated with gaseous ammonia under conditions resulting in a partial condensation of the steam. The ammonia is thus drawn into and through the wood, reacting with the wood components at the elevated temperature to produce a walnut-simulating color in the wood.

A method of procedure which may be followed in producing an artificial walnut having good characteristics may be substantially as follows. Wood, preferably having a grain more or less resembling the grain of walnut, such as yellow birch, is placed in a digester. The wood may be in log or lumber form, and in a seasoned or unseasoned condition, as the success of our method does not rest upon any particular physical condition of the wood. Apparently, the staining or darkening reaction arises as a result of the combination of the ammonia with certain of the woody constituents,—probably the ligneous constituents, which are sensitive to oxidation, particularly under alkaline conditions, into brown dyestuffs which color the wood to walnut shades. The wood is heated uniformly throughout, while the digester is open, to a temperature of at least 100° C., preferably about 120 to 150° C., but not materially higher, as at too high a temperature the wood tends to weaken and disintegrate. Heating transforms the moisture content of the wood into steam, most of which escapes and carries therewith the air formerly contained in the voids of the wood,—both air and steam escaping from the digester. While the wood is thus heated, the digester is closed, and gaseous ammonia under pressure—say, 50 to 75 pounds per square inch, or greater—is passed into the digester. Because the pressure of ammonia applied is greater than the steam pressure at the given temperature, partial condensation of the steam within the pores and interstices of the wood, to produce a partial vacuum in situ throughout such wood, takes place, the ammonia being forced into and through the wood and effecting a complete penetration thereof. The ammonia apparently reacts with the ligneous content of the wood, under these conditions, to produce colored, ligneous reaction products or dyestuffs, which are fixed in situ in the wood cells and impart to the wood a dark brown color, characteristic of walnut. After the wood has been completely stained, the digester may be exhausted to a suitable recovery system, and the stained wood removed while at its elevated temperature. Inasmuch as the solubility of ammonia gas in water at an elevated temperature is low, little free or unconsumed ammonia remains in the wood.

In our experiments, we found that heating the wood to, say, 110° C. and then ammoniating the heated wood at atmospheric pressure, while allowing the wood to cool somewhat below 100° C.—say, 90° C.—effected a staining of the wood, but the stain was much lighter in color than when the higher temperatures and pressures were used. It is possible, therefore, to control the intensity of stain from light to dark, by controlling the temperature and pressure of ammoniation. In any event, however, the heating is done at atmospheric pressure and the wood is heated above 100° C., so as to generate steam in the wood and thus to displace the air in the wood pores and interstices. The wood may then be ammoniated at the given temperature to which it has been heated under a pressure of ammonia greater than the steam pressure at the given temperature, to produce a dark stain; or it may be ammoniated at a temperature below 100° C.—say, 80° to 90° C.—at atmospheric pressure, to produce a much lighter stain. In such latter case, partial condensation of steam and a partial vacuum are also pro-

duced in situ throughout the wood, so that the ammonia is forced into the wood.

We are aware that it has been proposed to subject wood to vacuation by the use of an air pump, and then to ammoniate such wood under pressure. By our method, however, no such treatment, with its accompanying expense and special equipment, is necessary, and the action is quicker and more thorough.

Having thus described certain examples of procedure in practicing our invention, it should be obvious to those skilled in the art that these examples might be varied without departing from the spirit or scope of invention as defined by the appended claims.

We claim:

1. A method of impregnating wood with a fluid, which comprises displacing the air in the pores and interstices of the wood with a condensible vapor, and condensing such vapor to produce a vacuum in situ in such wood while the wood is enveloped in the fluid, thus causing such fluid to be drawn into and through such wood.

2. A method of impregnating wood with a fluid, which comprises heating the wood to a temperature above 100° C., thereby vaporizing its free moisture content and expelling and displacing its air content with steam, and condensing such steam to produce a vacuum in situ in such wood while the wood is enveloped in such fluid, thus causing such fluid to be drawn into and through such wood.

3. In a method of wood staining, that step which comprises ammoniating with gaseous ammonia heated wood containing steam in its pores, under conditions resulting in a condensation of such steam.

4. A method of staining wood, which comprises heating wood to a temperature above 100° C., thereby forming steam therewithin, and then ammoniating such wood, while hot, with gaseous ammonia, under conditions resulting in a condensation of such steam.

5. A method of staining wood, which comprises heating wood to a temperature above 100° C., thereby vaporizing its free moisture content and expelling and displacing its air content with steam; and confining and ammoniating such wood, while hot, with gaseous ammonia, under conditions resulting in a condensation of such steam.

6. A method of staining wood, which comprises heating wood to a temperature above 100° C., at atmospheric pressure, and then ammoniating such wood, while hot, with gaseous ammonia under pressure.

7. A method of staining wood, which comprises heating wood to a temperature of about 125° to 150° C., at atmospheric pressure, and then ammoniating such wood, while hot, with gaseous ammonia under pressure.

8. A method of staining wood, which comprises heating wood to a temperature of about 125° to 150° C., and then ammoniating such wood, while hot, with gaseous ammonia, under a pressure of about 75 pounds.

9. A method of staining wood, which comprises heating wood to a temperature above 100° C., thereby vaporizing its free moisture content and expelling and displacing its air content with steam; confining and ammoniating such wood, while hot, with gaseous ammonia under pressure, thereby resulting in a partial condensation of the steam in situ in such wood, and the penetration of the ammonia into and the staining of the wood; and removing such stained wood from confinement while in heated condition.

In testimony whereof we have affixed our signatures.

GEORGE A. RICHTER.
WALLACE B. VAN ARSDEL.
JOHN G. GOSSELINK.