

Nov. 30, 1943.

G. F. NEILS

2,335,528

METHOD OF TREATING LUMBER

Filed Feb. 17, 1940

FIG. 1.

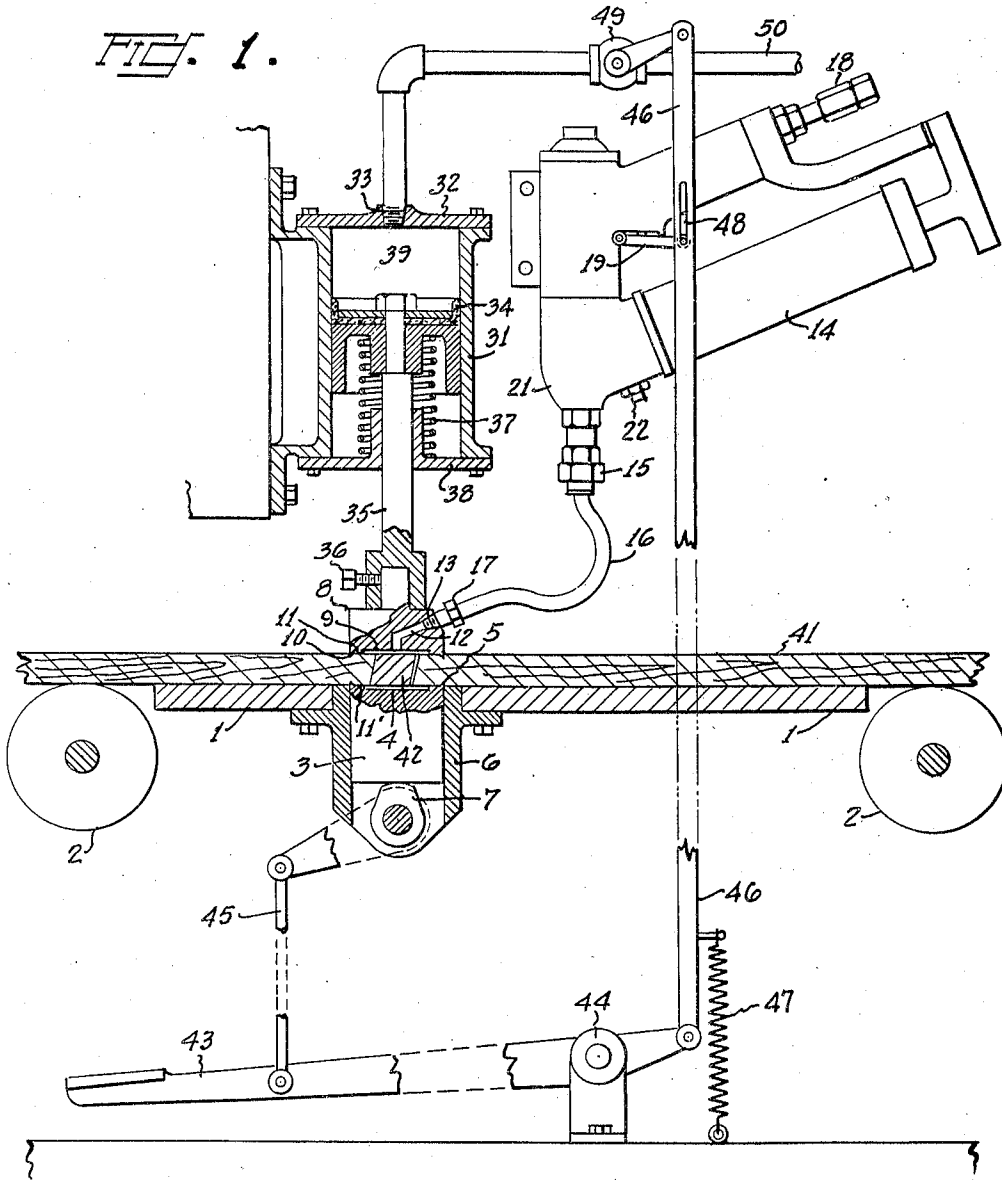
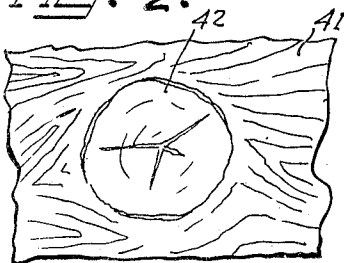


FIG. 2.



BY

INVENTOR
GERHARD F. NEILS
Barold F. Neils
ATTORNEY

UNITED STATES PATENT OFFICE

2,335,528

METHOD OF TREATING LUMBER

Gerhard F. Neils, Klickitat, Wash.

Application February 17, 1940, Serial No. 319,504

7 Claims. (Cl. 144—309)

This invention relates to the treatment of defects in wood, and has particular reference to a method of preventing knots from becoming loose and falling out of lumber and wood products, and involves the forcing of a cementitious material or filler, such as glue or the like, into any existing fissures or voids in and around knots to secure the knots permanently in place.

Lumber entirely free of defects is becoming more scarce, and consequently higher in price, with the passing of each successive year. As a result, it is becoming increasingly important to devise ways and means for utilizing imperfect lumber which in times past would have been discarded from the stocks of clear lumber. For many purposes, lumber having defects is useful and practically as satisfactory as clear lumber, provided that the checks and cracks are filled and the knots remain an integral part of the wood and do not become loose or separate themselves therefrom so as to leave knot holes. For such purposes much lumber which it is at present necessary to lay aside for rough work could be graded as clear lumber if the defects were treated so as to be less objectionable.

The general object of the present invention is to so treat defects in wood as to render them less objectionable, and thereby raise the grade of lumber having such defects.

A further object is to tighten knots in their natural locations in wood or lumber.

A further object is the prevention of degrade in the dressing operation after the lumber has been seasoned, in which condition heretofore the knots have become dried and brittle, and tended to chip under the action of the planer knives.

A further object is to prevent knots from becoming loose and separating themselves from the wood or board of which they are originally a part, by the application of cementitious material to unite the knots with the wood or board.

The primary object of the present invention, therefore, is to provide a novel and improved method and machine for accomplishing the objects hereinbefore set out.

In carrying out the above objects, the process of the present invention is two-fold in its scope. In the first place it involves the gluing or otherwise cementing of knots to prevent their getting loose or falling out of the piece of wood, or board. By applying appropriate cementing material to one face of the knot and surrounding wood, the voids, checks and cracks, both in and surrounding the knot itself, and also in the surrounding wood, will be filled, making the otherwise loose, or potentially

loose, knot a permanent part of the wood. Knots so treated will withstand planing and sawing operations which would otherwise chip, break, or dislodge them. The composition of the cementitious material may include sufficient filler to properly fill all the existing openings.

In the second place, the present process also involves the increasing of the moisture content of knots, to swell them more tightly in place, and the sealing of the knots so treated to prevent their drying out and loosening before the dressing operations are completed. An increased moisture content also facilitates the dressing operations by making the knot less brittle. An aqueous glue or bonding composition applied to the end grain on the faces of a knot will add to its moisture content and then upon setting will seal it against rapid loss of the acquired moisture. With an increased moisture content, it has been found that the knots are less subject to chipping, and when firmly bonded to the wood the sawing and planing operations will not disrupt the knots and lower the grade of the lumber. Unless so treated, knots have a natural tendency to rapidly lose moisture through the exposed end grains on their faces. This causes them to dry, or season, faster than the rest of the board, and since shrinkage in wood is greatest in directions transversely of the grain, the wood in the knot tends to shrink, or contract, pulling itself away from the surrounding board, and developing voids and cracks. Thus it will be understood how moisture applied to the faces of a knot will be readily absorbed into the end grain thereof, producing a lateral swelling or expansion to restore the knot to substantially its original condition of tightness and toughness.

In the treating of knots, then, the process of the present invention comprises the coating of one or both faces of a knot with a sealing and cementing material regardless of whether the knot is loose, potentially loose, or merely checked at the time it is treated. It is found advantageous to apply considerable pressure to the cementitious material, and to confine that pressure to the immediate vicinity of the knot being treated, but it is within the scope of the present invention to use cementing materials which will flow into the voids and cracks without the application of pressure, the essential requisite being that the knot is sealed and retained in place. If the cementing material is too thin to remain in place and perform its function, an exterior coating, or a paper cover, or the like, may be applied to retain the cementing material. A small piece of paper, for example, may conveniently be applied over each knot as a

step in the treatment, and will readily adhere to the freshly applied cementing material. The same procedure lends itself to the filling and sealing of cracks and voids not associated with knots.

These and other objects will become apparent as the disclosure proceeds in connection with the accompanying drawing.

Figure 1 is a side elevation view, partly in section, showing a machine for carrying out the method of the present invention.

Figure 2 is a fragmentary plan view showing an unsound knot in a piece of wood, or board, before treatment.

Referring now to the machine illustrated in Figure 1, there is shown a receiving table 1 which may be provided with conveyor rollers 2 for receiving stock to be treated. The rollers 2 may be idler rollers or they may be power driven rollers, as desired. The table 1 may extend on both sides of the machine, as illustrated, and may be provided with rollers 2 on both sides of the machine, if desired, to assist in removing the treated stock, as well as to bring it up to the machine. Supported substantially in the plane of the table 1 is the lower die or sealing member 3 having a slight central recess 4 in its upper face, an annular shoulder 11, and a sharpened upstanding peripheral rim 5 therearound. The sealing member 3 may be of any desired shape in plan view, such as circular, elliptical or the like, and may be carried by a correspondingly shaped housing or guiding member 6. There is illustrated a cam 7 for raising the sealing member 3 to the desired elevation with respect to the table 1, which cam may be made to move the member 3 between limiting positions in conjunction with the other moving parts of the machine, presently to be described.

Carried directly above the sealing member 3 by structure presently to be described is a corresponding companion sealing member 8 which, for convenience, may be designated the upper sealing member. The upper sealing member 8 is provided with a central recess 9, an annular shoulder 11, and a peripheral depending rim 10 in a manner similar to the lower sealing member 3. Communicating with the central part of the recess 9 is a conduit 12 having at its outer end a suitable coupling 13.

Means for introducing material under pressure into the recess 9 by way of the conduit 12 and the coupling 13 will now be described. A reservoir or vessel 14 is adapted to contain a supply of liquid glue, or other cementitious material, and to feed the same through the coupling device 15 into the flexible hose or cable 16 which carries at its lower extremity the coupling member 17 adapted to unite and seal with the previously mentioned coupling 13 on the upper sealing member 8. Connection to a suitable high pressure air supply is represented by the coupling 18. A trigger operated valve, indicated generally at 19, may be used to control the air pressure in conjunction with the operation of the machine. The glue containing vessel or reservoir 14 being inclined to discharge its contents into the chamber 21 above the coupling 15, the glue is in a position to be forced through the conduit 16 by the pressure of the compressed air when the latter is released by means of the trigger valve 19. A filler connection is indicated at 22.

Pressure cylinder means are provided for applying the upper sealing member 8 to the wood with considerable force. Such means comprise a cylinder 31 having a head 32 tapped at 33 to

receive an air pressure hose or conduit. Operating in the cylinder 31 is the piston 34 carrying the piston rod 35 to which is removably attached the upper sealing member 8 as, for instance, by means of the set screw 36. A spring 37 bearing against the lower shoulder of the piston rod guide 38 operates to raise the piston 34 when the air pressure is removed from the upper surface of the piston. Air pressure introduced into the opening 33 enters the chamber 39 between the cylinder head 32 and piston 34 and is sufficient to cause the piston to move downwardly against the action of the spring 37. The downward force of the piston rod 35, which is communicated to the upper sealing member 8, is sufficient to press the rim 10 of said sealing member against the relatively hard wood surrounding the knot and effect a seal therewith sufficient to prevent the escape of glue or filler material introduced under pressure into the recess 9. A board 41 is represented as having a knot 42 to be treated. When the rim 10 has been pressed into the wood, the annular shoulder 11 will rest firmly on the surface of said wood, thereby enhancing the seal and acting as a stop to limit the penetration of the rim 10. The lower sealing member 3 functions in the same manner, being on the opposite side of the lumber, and may be operated by the cam 7 to reciprocate in cooperation with the upper sealing member 8, causing the lower rim 5 to effect a seal with the wood, as illustrated, simultaneously with the sealing action of the upper rim 10.

There is illustrated in Figure 1 a mechanism for operating the various parts of the machine in timed relation to accomplish the functions described. The operating mechanism in the present embodiment responds to the movement of a foot pedal indicated generally at 43, and pivoted at 44. A link 45 is provided to rotate the cam 7 so as to raise the member 3 from its lower to its upper limit of movement when the pedal 43 is partially depressed. Depression of foot pedal 43 also raises the push rod 46 against the tension of spring 47 which tends to maintain the pedal 43 normally in raised position. A lost motion slot 48 in the push rod 46 operates the valve mechanism 19. The upper end of push rod 46 operates the valve 49 in the air pressure line 50.

The arrangement of the operating mechanism just described is such that the first downward movement of pedal 43 will raise the lower sealing member 3 into the position illustrated, where it will be held by the cam 7 throughout the full stroke of the pedal. Further downward movement of the pedal 43 will open the valve 49, causing the upper sealing member 8 to descend with force and assume the position illustrated. The last part of the downward movement of the pedal 43 will then operate the valve 19, causing material from chamber 21 to enter the recess 9 under pressure to perform its intended functions. When the foot pedal 43 is allowed to resume its normal raised position the described sequence of operations will be reversed. If desired, the two sealing members 3 and 8 may be caused to extend themselves simultaneously instead of successively.

In Figure 1 there is shown the board 41 in place in the machine to receive treatment. The board 41 has a checked knot 42 therein which it is desired to seal or to secure in place so that it will not subsequently become loose or entirely dislocated. The parts of the machine are shown in Figure 1 in the position they would assume when

air pressure is introduced to the chamber 39, causing rims on the upper and lower sealing members 2 and 3, respectively, to be pressed against the wood and effect sealing engagement therewith. It will then be seen that cementitious or filling material introduced under pressure into the recess 9 will be forced into any voids, cracks or fissures existing around or in the vicinity of the knot 42 and also into any openings in the grain of the wood around said knot, as well as into any openings in the knot itself, and will flow through all such passageways to the lower side of the board 41 and into the recess 4. The recess 4 will thereby be continuously full of material which will coat and seal the lower face of knot 42, making it unnecessary to provide other means for introducing such material into the recess 4. In this manner any knots that are not absolutely sound and tight will receive cementitious material under pressure in those parts thereof which are not sound and tight so that said knots will be permanently cemented in place and sealed on both faces, and will for all practical purposes form an integral part of the original board. In the same manner, knot holes, or cracks and voids not associated with knots, may be filled under pressure to raise the grade of the lumber.

Figure 2 illustrates by way of an enlarged plan view the checks and voids in and around the knot 42 before being filled with cementitious material. If such a knot were not treated according to the present invention, it would eventually become broken and dislodged in whole or in part from the board 41, leaving a knot hole and thus lowering the grade of the lumber.

Various modifications and changes will suggest themselves to one skilled in the art, and it is intended to include in the present invention all such modifications and changes as fall within the scope of the appended claims. Also, it is not intended that the present invention be limited to lumber as such, because it is applicable to all forms of wood, including special shapes, and veneers, where loose or broken knots, or cracks and voids, are objectionable.

While pressure means are illustrated for forcing the glue or filler into interstices, it is intended to use only sufficient pressure to insure penetration. The process may be practiced without the application of pressure if the glue or cementing material is conveyed into the cracks by means of a sufficiently fluid vehicle.

An aqueous solvent, or vehicle, is of course desirable when it is intended to increase the moisture content of the wood in the knot, but for performing merely the functions of cementing and sealing the knot, non-aqueous compositions would be satisfactory. Ordinary animal glue, or a water-resistant animal glue, may be used with success for certain purposes, or, for other purposes a completely waterproof thermo-setting cement such as a synthetic resin may be employed. Such a synthetic resin may be applied in a liquid carrier, as used, for instance, in the plywood industry, and the resin caused to attain a permanent set. Alternatively, a synthetic resin in powder form may be injected into the voids in a dry state, and then caused to set, in accordance with the requirements of the particular resin used.

The term "cementitious material" is used herein to define any of the above materials which may be used to fill knot holes, cracks, voids, checks, or interstices in the knot itself, in the wood surrounding the knot, or existing between

the wood and the walls of the knot. Such "cementitious material" may be chiefly animal glue, casein glue, silicate of soda, or any other kind of gluing material, or it may be a synthetic resin having bonding properties. Any other material having bonding properties in connection with wood may be used, either alone or mixed with a suitable filler material such as wood flour, sawdust, fibrous material, putty, or the like. For certain purposes it is desirable to make the color of the filler or cementitious material the same as the color of the wood to which it is applied, so as to be inconspicuous. In the filling of knot holes the color of the filler may, if desired, be matched with the natural color of the sound knots, which is usually darker than the surrounding wood.

Having now described my invention and in what manner the same may be used, what I claim as new and desire to protect by Letters Patent is:

1. The method of preventing dislocation of a knot in lumber in which said knot is exposed on different faces thereof, comprising forming a closed chamber over a part of each of said faces including said knot so that respective ones of said faces forms one wall of each of said chambers, forcing cementitious material into one of said chambers under pressure sufficient to cause said cementitious material to penetrate voids in said knot and immediately therearound, and allowing said cementitious material to set.

2. The method of preventing dislocation of a knot in lumber, comprising forming a substantially sealed chamber in which said knot and the wood immediately surrounding said knot form one side of said chamber, forcing cementitious material into said chamber under pressure sufficient to cause said cementitious material to penetrate voids in said knot and immediately therearound, and allowing said cementitious material to set.

3. The method of preventing dislocation of a knot in lumber, comprising the steps of applying to both faces of said knot an aqueous cementitious material under pressure sufficient to penetrate and fill the interstices in said knot and then allowing said cementitious material to set, thereby sealing said knot to preserve its original condition of tightness and toughness.

4. The method of preventing dislocation of a knot in lumber which comprises feeding a quantity of cementitious filling material onto a portion of the surface of the lumber and at least over the end of said knot, confining said material within a predetermined area on the surface of said lumber including said end of said knot, applying a pressure to said material sufficient to force said material into cracks and spaces in and about said knot throughout substantially the full extent thereof, and allowing said material to set.

5. The method of preventing dislocation of a knot in lumber comprising feeding a quantity of cementitious filling material onto a portion of one surface of the lumber adjacent one end of a knot extending therethrough, confining said material within a predetermined area on said lumber surface including the end of said knot, applying a pressure to said material to force same into spaces in and about said knot, providing a backing for a portion of the opposite surface of said lumber including at least the opposite end of said knot for restricting flow of said material through said spaces from said opposite lumber

surface, and allowing the cementitious material to set.

6. The method of preventing dislocation of a knot in lumber comprising forming a substantially sealed chamber over a portion of one surface of the lumber in surrounding relation with respect to the end of the knot, feeding a cementitious filling material into said chamber under a pressure sufficient to cause said material to substantially fill cracks and spaces in and about said knot, providing a backing for the opposite surface of said lumber including at least the corresponding end of said knot whereby flow of said material from said opposite end of said knot is substantially restricted, and allowing the cementitious material to set.

7. The method of treating defects in lumber such as cracks and openings in the faces of said lumber, comprising forming a substantially sealed chamber over a portion of one surface of the lumber in surrounding relation with respect to the defective portion of said lumber, feeding a cementitious filling material into said chamber, applying pressure to said filling material sufficient to cause said material to substantially fill the cracks and openings which open into said chamber, removing said chamber, applying a protective material over said filled surface during setting of said material, and allowing said material to set.

GERHARD F. NEILS.