Jan. 15, 1946. G. F. NEILS 2,392,827

KNOT SEALING MACHINE

Filed June 16, 1942 2 Sheets-Sheet 1

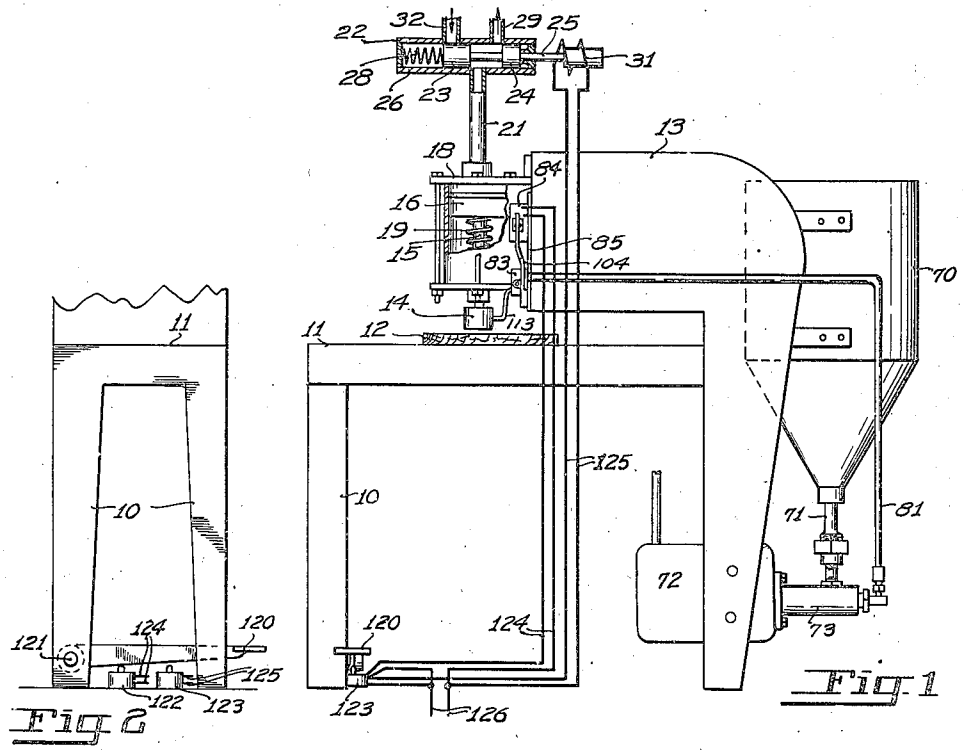


Fig 2

Fig 1

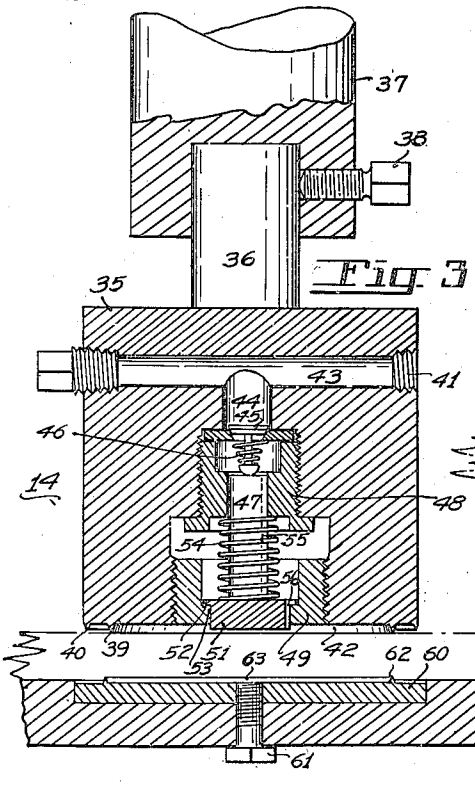


Fig 3

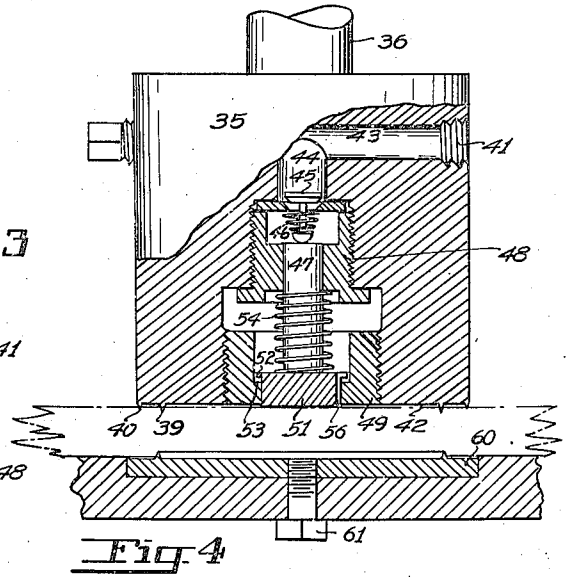


Fig 4

GERHARD F. NEILS
INVENTOR.

BY Harold C. Cook

ATTORNEY

Jan. 15, 1946. G. F. NEILS 2,392,827

KNOT SEALING MACHINE

Filed June 16, 1942 2 Sheets-Sheet 2

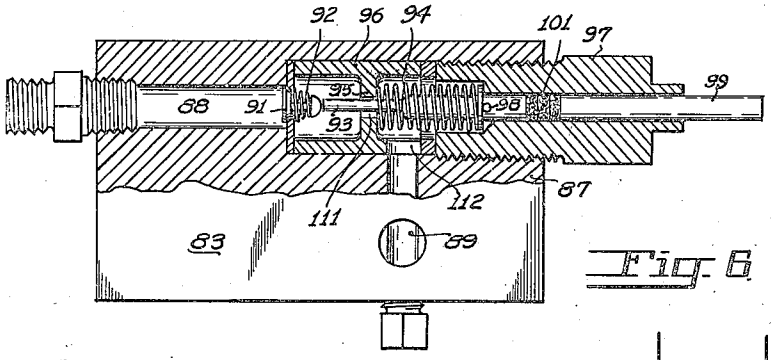


Fig. 6

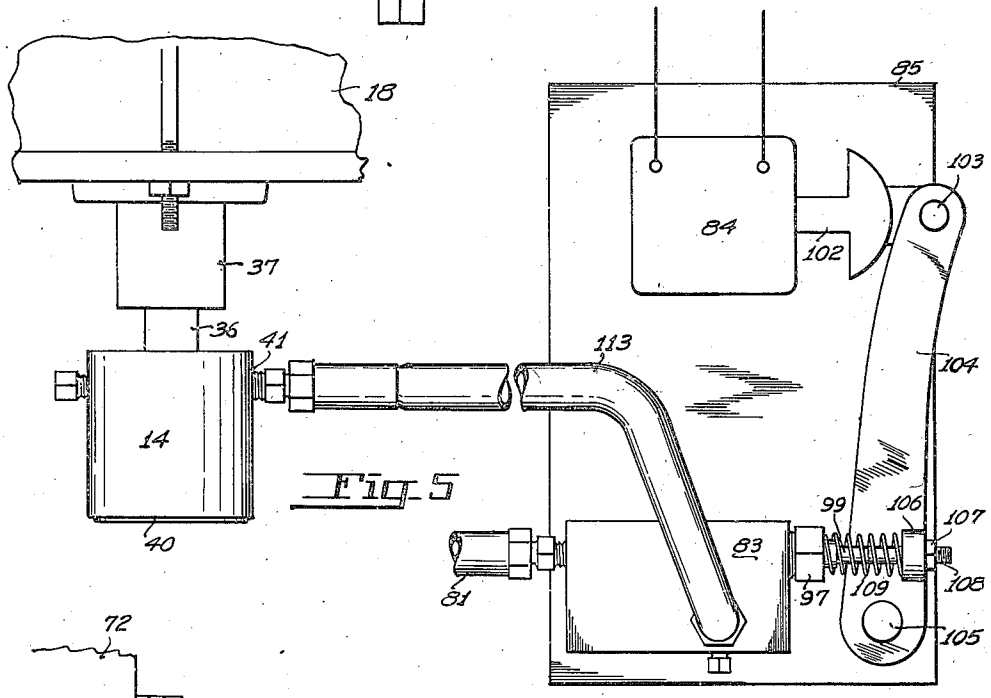


Fig. 5

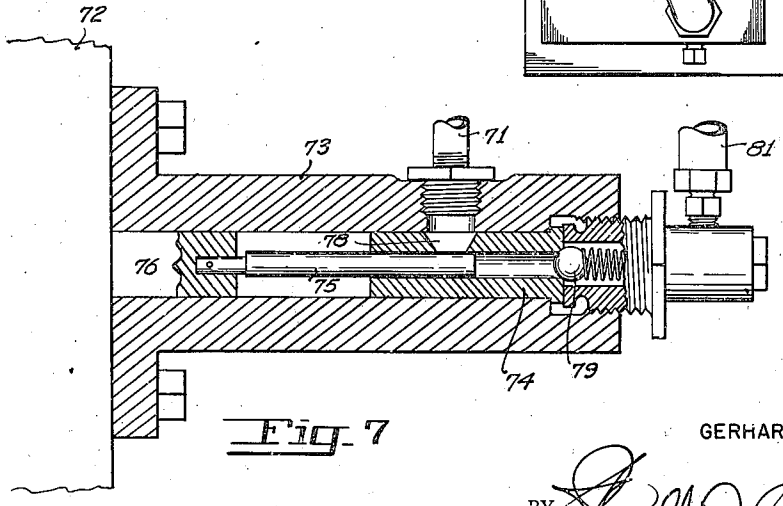


Fig. 7

GERHARD F. NEILS
INVENTOR.

BY Harold E. Cook

ATTORNEY

Patented Jan. 15, 1946

2,392,827

UNITED STATES PATENT OFFICE

2,392,827

KNOT SEALING MACHINE

Gerhard F. Neils, Klickitat, Wash.

Application June 16, 1942, Serial No. 447,255

16 Claims. (Cl. 144—2)

This invention relates to apparatus for treating defects in wood, and has particular reference to a machine for securing knots in lumber and wood products in general by forcing cementitious filling material into cracks and spaces in and around knots whereby they are fastened permanently in place.

With the depletion of forest reserves, attention is being given to the matter of so treating lumber as to obtain the most economical utilization thereof. This is particularly true with respect to the lower grades of lumber, which comprise the greater percentage of the total mill output, and which is defective and unsuitable for many uses solely by reason of knots extending therethrough. The grain of knots extends at right angles with respect to the grain of the surrounding wood, and hence the wood of the knots tends to dry or season faster than the rest of the board. The resulting shrinkage of the knot causes it to pull away from the surrounding wood, developing cracks and spaces through the knot and therearound, and loosening the knot to such an extent that it may fall from the board leaving a hole therein. Such shrinkage and dropping out is particularly common with black knots, that is, knots resulting from growth of the wood about dead branches, in which case the wood of the knot is not firmly bonded to the wood thereabout. Boards having such knots therein are customarily degraded at the mill and are usually segregated for remanufacture into small dimension stock such as box shook, sash and door stock, or the like, in which procedure the portions of the lumber containing the unsound knots are thrown out as scrap. Such procedure not only results in the wastage of a considerable amount of wood, but the price of the salvaged sound stock is considerably increased due to high remanufacturing costs. If, on the other hand, such knots are so treated as to prevent their becoming loose and falling from the lumber, the soundness of the board is greatly increased and its serviceability extended many fold.

In Letters Patent No. 2,335,528, issued to me November 30, 1943, is disclosed a method for treating knots in lumber so as substantially to prevent their becoming loose and falling out, and which method includes the step of forcing a cementitious filling material into the checks and cracks in and about the knots in a piece of lumber, which material, upon setting, permanently secures the knots in place. It is a general object of the present invention, therefore, to provide a new and improved apparatus for carrying out the method disclosed in the above identified companion application.

More specifically stated, it is an object of the present invention to provide a new and improved apparatus for forcing cementitious filling material into cracks and spaces in and around knots in a piece of lumber whereby they may be substantially permanently secured in place.

A further object of the invention is to provide a new and improved machine for applying a cementitious filling material to one end of a knot extending through a piece of lumber under a sufficient pressure for substantially filling the cracks and spaces in and around such knots, the apparatus being so designed that a minimum wastage of filling material occurs through the operation of the machine.

A still further object of the invention is to provide a new and improved machine for applying a cementitious filling material to and end of a knot extending through a piece of lumber for securing the knot firmly in position, which machine is relatively rugged, fast in operation, and simply and easily controlled.

In accordance with the illustrated embodiment of the invention, the machine comprises a stationary support having a table for firmly supporting a section of a board thereupon. Secured upon a bracket overhanging the table is a pressure head operable by a servo-motor and having a reciprocating movement relative to the upper surface of the board positioned therebeneath. The head is so designed that when it is moved into engagement with the board, the lower surface thereof forms a substantially sealed chamber surrounding the upper end of a knot extending through the board. A passage is provided through the head through which a suitable cementitious filling material is fed into the chamber under a sufficient pressure so that the material is forced into all the spaces and cracks in and about the knot. The filling material is supplied from a suitable reservoir by a pressure imposing device arranged in a conduit connected to the passage in the movable head. The machine further includes the arrangement of an automatically operable stop valve in the head, a control valve in the high pressure conduit, a control means for the servo-motor, the control valve and servo-motor control means being further connected for operation through a manual controller so designed as to insure that the flow of filling material through the head is properly timed with the movement of the pressure head so that there will be a minimum wastage of the filler material. The control system

for the machine is also so designed that the proper sequence of operation follows automatically upon a single impulse from a machine operator with a minimum of elapsed time required for the complete operating cycle. By virtue of the high efficiency of the machine, its speed of operation, and ease of control, the total operating costs are reduced to such an extent as to make it commercially feasible to so treat relatively low grade lumber.

Additional objects and advantages of the invention will appear from the following description, taken in connection with the accompanying drawings, while the features of novelty characterizing the invention will be set forth in the claims appended hereto.

In the drawings, Figure 1 is a side elevation of a knot sealing machine constructed in accordance with one form of the invention; Figure 2 is a fragmentary front elevation of the machine shown in Figure 1 showing the arrangement of the operating switches; Figure 3 is an enlarged sectional view of the pressure head, taken along the line 3—3 of Figure 1; Figure 4 is a fragmentary view of the head corresponding to Figure 3, shown in a second position of adjustment thereof; Figure 5 is an enlarged view illustrating certain details of the machine control arrangement; Figure 6 is a longitudinal sectional view of the control valve shown in Figure 5; Figure 7 is a cross sectional view of a portion of the pump mechanism shown in Figure 1.

Referring to the drawings, the machine comprises a stationary support including legs 10 and a table 11 for supporting a portion of a board such as 12 thereupon in a substantially horizontal position. It is to be understood that the opposite end portions of the board may be supported either upon suitable side extensions of the table 11 or upon any other suitable supporting means.

Mounted upon the end of a bracket arm 13 overhanging the table 11 for movement perpendicularly thereof is a pressure head 14. In the specific arrangement shown the head 14 is carried upon the lower end of plunger 15 secured to the piston 16 of a servo-motor 18. The head may be biased upwardly by spring 19 arranged within the lower end of the servo-motor cylinder. While a servo-motor is shown for reciprocating the head 14 into and out of engagement with respect to the upper surface of the board 12, it will be understood that any suitable motor means may be provided for accomplishing such movement. Operating fluid for the servo-motor 18 may be supplied through conduit 21 and control valve 22. The control valve 22 may be of any suitable type such as the electromagnetically operable device indicated, having a pair of heads 23 and 24 mounted upon a stem 25 and slidably arranged within a cylinder 26. The valve heads are normally biased to the right by means of a suitable spring 28, in which position the conduit 21 communicates with exhaust port 29. Upon energization of the solenoid 31 the valve heads are shifted to the left, closing the exhaust port 29 and connecting conduit 21 with the inlet port 32 for supplying suitable pressure operating fluid to the servo-motor 18.

The head 14 comprises generally a conduit means which, when forced into engagement with the upper surface of the board 12, effects a substantial seal therewith about the conduit opening so that a cementitious filling material fed therethrough onto the upper surface of the board is confined under pressure within the predetermined area. In the specific form shown in detail in Figure 3, the head 14 is made from a round block 35, the upper surface of which is provided with a shaft extension 36 adapted to be secured to the lower end 37 of the servo-motor plunger by means of suitable set screw 38. The lower surface of the head is provided with a plurality of concentric downwardly extending sharp edged protrusions 39 and 40 which define a recess or cavity in the lower surface of the head. These protrusions or knife edges extend continuously around the edge portion of the block 35 and are preferably of varying heights, as shown in this instance, the inner knife edge 39 being higher than the adjacent outer knife edge 40. As the head is moved into engagement with the upper surface of the board 12 the knife edges embed themselves in the wood surface forming a substantially sealed chamber 42 between the upper surface of the board and the lower surface of the head 14.

For feeding the filler material into the chamber 42, a passage provided through the head 14 is formed by a transverse bore 43 having an inlet opening 41, and a central bore 44 extending upwardly from the lower surface of the head and communicating with the transverse bore 43. Mounted within the passage is a valve 45 normally biased to the closed position by spring 46. A stem 47 is slidably arranged within the bushings 48 and 49 threaded into cooperating portions of the bore 44, the stem 47 having an enlarged head 51 at the lower end thereof with a shoulder 52 normally biased by spring 54 into engagement with the flange portion 53 of the bushing 49. In the seated position of the valve the lower end of the enlarged head 51 depends slightly below the lower surface of the head 14 and is adapted to be engaged upon movement of the head downwardly into engagement with the upper surface of the board 12. Engagement with the board moves the stem 47 upwardly and unseats the valve 45, thereby permitting filler material to flow through the slot 55 provided in one side of the stem 47 and through slot 56 provided in one side of the enlarged head 51 into the chamber 42 formed above the surface of the board 12.

Because of the fact that the checks and cracks through and about the knot in the board generally extend the full length of the knot, that is, from one side of the board to the other, provision must be made for preventing free flow of the filling material therethrough in order that a suitable pressure will be built up to insure a complete filling of the smaller crevices. It will readily be understood that unless a suitable backing is provided on the reverse side of the board, the filling material will follow the path of least resistance through the knot without any appreciable pressure being built up therewithin. As shown more clearly in the views of Figures 3 and 4, the table 11 is provided with a disc insert 60, the upper surface of which extends somewhat beneath the plane of the upper surface of the table. The insert 60 is held firmly in place by means of suitable screws 61 extending upwardly through a cooperating opening in the table 11. The upper surface of the insert is provided with an upwardly extending continuous knife edged protrusion 62, the uppermost edge of which extends somewhat above the plane of the table 11 and defines a recess centrally of the insert of substantially the same size as the recess in the lower surface of the head 14. The insert 60 is aligned with the movable head 14

so that when the head 14 is forced downwardly into engagement with the upper surface of the board 12 the knife edged protrusion 62 is embedded in the lower surface of the board to form a substantially sealed chamber 63 about the lower end of the knot. Preferably only a single knife edge 62 is provided on the insert 60 so that the chamber 63 will be sealed less tightly than the upper chamber 42 in order that air may be displaced from the region between the head 14 and the table top, including that from the cracks and spaces in and about the knot in the board, which air may escape past the knife edge 62. The seal thus provided, however, is sufficiently tight so as substantially to prevent leakage of the cementitious filling material therepast and permits a relatively high pressure to be built up between the two chambers 42, 63, resulting in a complete filling of all spaces within the knot with little or no wastage of the filling material.

The cementitious filling material may be supplied to the pressure head 14 by any suitable means from a reservoir 70 mounted at the rear of the machine. As shown, the reservoir 70 is in the form of a gravity flow hopper which feeds through connection 71 into the cylinder of an automatic pumping device 72. The details of the device 72 form no part of the present invetnion, such devices being well known in the art, and only the essential details of the pump head thereof are illustrated in the enlarged cross sectional view of Figure 7. The pump head comprises a tubular member 73 provided with a pump cylinder 74 fitted closely therewithin and within which cylinder is slidably mounted piston 75 operatively connected to the end of a shaft 76 extending from the operating mechanism of the device 72. Material from the hopper 70 flowing through the connection 71 is admitted into the cylinder 74 through the side port 78 and by reciprocation of the piston 75 is forced from the discharge end thereof past the check valve 79 into the high pressure conduit 81. For controlling the flow of the filler material from the high pressure conduit 81 to the pressure head 14, a control valve mechanism 83 is provided and which is connected for operation by an electromagnetic device 84. The control valve 83 and the electromagnetic operator 84 are mounted upon a backing plate 85 which in turn is suitably secured to the end of the bracket arm 13 adjacent the servo-motor 18. Referring more particularly to the views of Figures 5 and 6, the valve mechanism 83 comprises a housing 87 having an inlet passage 88 and an outlet passage 89 formed therein. Arranged between the inlet and outlet passages is a valve 91 normally biased to the closed position by means of a spring 92, which valve is operable to the opened position by a plunger 93 normally biased in the direction away from the valve by a spring 94. The end of the plunger 93 adjacent the valve 91 is guided within a cooperating opening provided in the web 95 of the cylindrical member 96, while the opposite end of the plunger is slidable within a cooperating bore provided in the bushing 97. The spring 94 is compressed between the web 95 and pin 98 extending through the plunger 93. The plunger 93 is operable to the left as viewed in Figure 6 for unseating the valve 91 by means of a stem 99 projecting from the outer end of the bushing 97, suitable packing 101 being provided between the adjacent ends of the stem 99 and the plunger 93 in order to preclude leakage of filler material through the bushing 97.

The electromagnetic operating device 84 may be of any suitable type including an armature 102 which may be connected as at 103 to the end of a lever 104 pivoted as at 105 to the backing plate 85. Threaded into an upstanding boss 106 and secured relative thereto by lock nut 107 is a pin 108 which is adapted to engage with the end of the stem 99 projecting from the valve mechanism 83. The lever 104 is normally biased away from the valve mechanism by means of a spring 109 surrounding the adjacent ends of the stem 99 and pin 108 and compressed between the bushing 97 and the boss 106. Upon energization of the winding of the electromagnetic device 84, the lever 104 is moved in the counterclockwise direction about the pivot 105, depressing the stem 99, moving the plunger into engagement with the valve 91 to cause the opening thereof. Filler material under high pressure is thereupon permitted to pass from the inlet passage 88 through the opening 111 in the web 95 and opening 112 through the cylindrical member 96 into the outlet passage 89. From the outlet passage 89 the filler material is conducted through the flexible tubing 113 to the inlet 41 of the pressure head 14. Upon the deenergization of the electromagnetic device 84 spring 109 shifts the lever 104 away from the valve stem 99 permitting it to be moved to the right under force of the spring 94 which in turn will permit closure of the valve 91. With this arrangement of the control valve at the end of the high pressure conduit 81, the flexible tube 113 and the pressure head 14 will not be subjected to high pressures during periods of inoperation of the machine.

For controlling the operation of the machine a manual control lever such as a foot pedal 120 is provided which may be pivoted at one end 121 to one of the front legs of the support 10. A pair of switches 122 and 123 are arranged beneath the lever 120 for actuation thereby, and which are connected through pairs of conductors 124 and 125, respectively, to the solenoids of the electromagnetic devices 31 and 84. The circuits 124 and 125 may be suitably connected to a source of supply, indicated by conductors 126. The switches 122 and 123 are so arranged with respect to the lever 120 that upon operation of the lever the solenoid 31 will be energized first to admit operating fluid to the servo-motor 18 for lowering the pressure head 14 onto the upper surface of the board 12 slightly in advance of the movement of the valve mechanism 83 to the open position. It is also preferred that the control valve 83 be closed slightly in advance of the movement of the pressure head 14 away from the board 12. Any suitable means may be provided for effecting such sequence of energization for the electromagnetic devices 31 and 84 such as the arrangement shown, in which the switch 122 is arranged closer to the end 121 of lever 120 than the switch 123. Thus it will be obvious that the switch 122 will be engaged and moved to the closed position in advance of the similar operation of switch 123 and will be maintained in such condition until after the switch 123 is released for open circuit movement.

With the arrangement of apparatus as described, a substantially constant predetermined high pressure is maintained within the supply conduit 81 by virtue of the pumping device 72, but this high pressure normally extends only as far as the control valve 83. The pressure head 14 is normally under little or no pressure, though the stop valve 45 precludes leakage of the filling

material from the pressure head 14 during such periods of time as when the board 12 is being adjusted upon the table 11 so as to bring the knots into alignment beneath the pressure head 14. Also when there are no boards upon the table leakage of filling material onto the table top is substantially precluded. Upon the closure of the switch 122 and energization of the solenoid 31, operating fluid is admitted through the valve 22 to the servo-motor 18, whereupon the pressure head is moved downwardly into engagement with the upper surface of the board 12. Initial engagement with the upper surface of the board is first effected by the inner knife edged protrusion 39 which embeds itself beneath the board surface. Continued downward movement of the pressure head 14 will effect the engagement with the board of the lower end of the head 51 of the stop valve operating stem 47, the upward movement of which causes unseating of the stop valve 45. Substantially simultaneously, the outer knife edged protrusion 40 will move into contact with the upper surface of the board, augmenting the protrusion 39 in the formation of a substantially tight seal for the chamber 42 surrounding the upper end of the knot in the board surface beneath the pressure head. Due to the force exerted by the pressure head through the two knife edged protrusions 39 and 40 upon the upper surface of the board, the board will be driven down upon the circular knife edged protrusion 62 extending upwardly from the table 11 and which will become embedded in the lower surface of the board about the end of the knot opposite the pressure head. After the stop valve 45 is moved to the opened position, the closure of the control switch 123 will effect the energization of the electromagnetic device 84 which in turn will open the control valve 83 to permit a quantity of filler material to flow from the high pressure conduit 81 through the connection tube 113 into the pressure head 14.

In the normal operation of the machine, the above described sequence takes place within a very short period of elapsed time merely upon the depressing of the foot pedal 120. By reason of this fact, the rate at which knots may be treated is so high that the cost per one thousand board feet of lumber is well within the range of economic feasibility.

Having described the invention in detail, it is to be understood that such details are merely illustrative and that the invention may be carried out by other means.

I claim:

1. A machine for securing a knot in a piece of wood, comprising a support for said piece, a member having a cavity therein movable in opposing relation to said support whereby said cavity is caused to cover and enclose an end of a knot in said piece, means for moving said member away from said support, means for moving said member towards said support to forcibly engage said piece whereby a substantially sealed chamber is formed by said cavity over said knot end, an inlet in said member communicating with said cavity for introducing cementitious material into said sealed chamber under pressure and means for forcing said material into spaces in and around said knot.

2. A machine for securing a knot in lumber, comprising a support for engaging at least a portion of one surface of the lumber including said knot, conduit means movable relative to said support into engagement with a portion of the opposite surface of said lumber and into surrounding relation with respect to the corresponding end of said knot, means for applying a sufficient pressure between said support and said conduit means so as substantially to seal the periphery of said conduit means against said lumber surface, means for subsequently feeding cementitious filling material into said conduit means, and means for applying pressure to said material sufficient to cause said material to substantially fill cracks and spaces in and about said knot throughout substantially the full extent thereof.

3. Apparatus for securing a knot in lumber which comprises conduit means for engaging with a portion of one surface of the lumber in surrounding relation with respect to the corresponding end of said knot, means for applying a pressure to said conduit means so as to effect a substantial seal between the periphery thereof and said lumber surface, means for feeding a cementitious filling material into said conduit means, means for applying a high pressure to said material for causing said material substantially to fill cracks and spaces in and about said knot, means for supporting the surface of said lumber opposite said conduit means including means for restricting flow of said material from openings at the opposite end of said knot.

4. Apparatus for securing a knot in lumber which comprises conduit means for engaging a portion of one surface of said lumber in surrounding relation with respect to a corresponding end of said knot, means for applying a pressure to said conduit means so as to effect a substantial seal between the periphery thereof and the adjacent lumber surface, means for feeding a cementitious filling material into said conduit means, means for applying a high pressure to said material fed into said conduit means, a valve for controlling flow of said material into said conduit means, control means for opening said valve after said conduit means has been sealed against said lumber surface, and means for supporting the surface of said lumber opposite said conduit means.

5. Apparatus for securing a knot in lumber which comprises conduit means for engaging a portion of one surface of the lumber in surrounding relation with respect to a corresponding end of said knot, a sharpened rim on the end of said conduit, means for applying a pressure to said conduit means whereby said sharpened rim is embedded in said lumber surface about said knot for effecting a substantial seal between said conduit means and said lumber surface, means for feeding a cementitious filling material into said conduit means, means for applying a pressure to said filling material sufficient to cause said material substantially to fill cracks and spaces in and about said knot, a valve for controlling flow of said material into said conduit means, means for supporting the surface of said lumber opposite said conduit means, said supporting means including means defining a substantially sealed chamber about the end of said knot opposite said conduit means.

6. A machine for securing knots in lumber which comprises a table support for cooperatively receiving a board thereupon, a pressure head movably mounted above said support, means for moving said head downwardly into engagement with said board, means depending downwardly from the lower surface of said head for forming a substantially sealed chamber between said head

and said board surrounding the upper end of a knot in said board, a source of cementitious filling material under pressure, a passage through said head for supplying cementitious filling material to said chamber, valve means in said passage normally biased to the closed position, a valve actuating stem slidably arranged in said head and having one end projecting from the lower surface thereof a distance less than that of said seal forming means, said valve stem end being adapted to be engaged by the upper surface of said board for effecting an opening movement of said valve subsequent to the formation of said sealed chamber.

7. A machine for securing knots in lumber which comprises a table support, a head mounted above said support for movement downwardly into engagement with the upper surface of a board positioned on said table, a continuous sharp edged protrusion extending downwardly from the lower surface of said head, said protrusion effecting a substantially sealed chamber between the lower surface of said head and the upper surface of said board as said head is moved downwardly into engagement therewith, a recess in said table aligned with said head, a continuous sharp edged protrusion extending upwardly from said table around said recess so as to form a substantially sealed chamber between said table and the lower surface of said board, said two sealed chambers being adapted for surrounding the opposite ends of a knot extending through said board, and a passage through said head for conducting cementitious filling material under pressure to said upper chamber.

8. A machine for securing knots in lumber which comprises a table support, a head mounted above said support for movement downwardly into engagement with the upper surface of a board positioned on said table, means depending from the lower surface of said head for engaging with the upper surface of a board and forming a substantially sealed chamber between said head and said board surface, a passage through said head for conducting cementitious filling material under pressure into said chamber, means extending upwardly from said table for engaging with the underneath surface of said board for forming a substantially sealed chamber between said table and said board, said two chambers forming means aligned with each other for surrounding opposite ends of a knot extending through said board.

9. A machine for securing knots in lumber which comprises a table support for receiving a board thereupon, a pressure head mounted above said support for movement at right angles with respect thereto, means for moving said head downwardly into engagement with the upper surface of said board, a recess in said head for forming an enclosed chamber around the end of a knot as said head is moved into engagement with the upper surface of said board, a passage through said head for conducting a cementitious filling material under high pressure into said chamber, valve means arranged in said passage, means normally biasing said valve to the closed position, and means associated with said valve for automatically shifting said valve to the opened position after movement of said head into engagement with the board surface.

10. A machine for securing knots in lumber which comprises a support for receiving a board thereupon, a pressure head movably mounted above the upper surface of said support, means for moving said head downwardly into engagement with the upper surface of a board positioned on said support, a recess in the lower surface of said head for forming an enclosed chamber surrounding the upper end of a knot in said board, a passage through said head for conducting cementitious filling material into said chamber, means for applying pressure to said filling material, valve means in said passage normally biased to the closed position, means associated with said valve for operating said valve to the opened position after movement of said head into engagement with the surface of said board to close said chamber, and means closing said valve upon initiation of movement of said head away from said board and prior to the opening of said chamber.

11. A machine for securing knots in lumber which comprises a support, a pressure head movably mounted above said support, means for moving said head downwardly into engagement with the upper surface of a board positioned on said support, a recess in the lower surface of said head for defining a chamber surrounding the upper end of a knot in said board as said head is moved into engagement with said board, said recess being defined in part by a circular knife edged portion depending from the lower surface of said head for penetrating the surface of the board around said knot so as substantially to seal said chamber, a passage through said head for conducting cementitious filling material under pressure to said chamber, valve means in said passage normally biased to the closed position, means engaged by the upper surface of said board following initial engagement of said knife edge therewith for effecting opening of said valve, and means for closing said valve in advance of complete withdrawal of said knife edge from said board surface.

12. A machine for securing knots in lumber which comprises a support, a head mounted above said support for movement downwardly into engagement with the upper surface of a board positioned on said support, means depending from the lower surface of said head for defining a substantially sealed chamber between said head and said board, a passage extending through said head, a source of cementitious filling material under pressure, conduit means for conducting filling material from said source to said passage and chamber, a valve for controlling flow of material from said conduit means to said passage, a motor for effecting downward movement of said head into engagement with said board, and control means for said valve and said motor for effecting first energization of said motor and subsequently the opening of said valve.

13. A machine for securing knots in lumber which comprises a support, a head mounted above said support for movement downwardly toward said board, means depending from the lower surface of said head for forming a substantially sealed chamber between said head and said board, a passage through said head communicating with said chamber, a stop valve in said passage, means associated with said valve and engaged by said board after formation of said sealed chamber for opening said stop valve, a motor for moving said head downwardly on said board, a conduit for supplying cementitious filling material under pressure to said passage, a control valve in said conduit, and manual control means for energizing said motor and for subsequently effecting opening of said control valve.

14. A machine for securing knots in lumber

which comprises a support for cooperatively receiving a board thereupon, a head mounted for vertical reciprocating movement above said support, an electro-magnetically controlled servo-motor for actuating said head, circular ridges extending downwardly from the lower surface of said head adjacent the outer edge thereof for forming an enclosed chamber between the lower surface of said head and the upper surface of said board in a surrounding relation with respect to the end of a knot therein, a passage through said head communicating with said enclosed chamber, a normally closed stop valve in said passage, a valve actuating stem mounted in said passage having an end extending below the lower surface of said head, said end of said stem being adapted to be engaged by the upper surface of said board for opening said stop valve, a source of cementitious filling material, a conduit extending from said source to said passage, means for transferring material from said source to said conduit under pressure, an electromagnetically operable control valve in said conduit, and manually operable switch means for effecting first the energization of said servo-motor and subsequently the opening of said control valve.

15. A machine for filling holes and the like in lumber, comprising a support for a piece of lumber, a member having a cavity therein movable in opposing relation to said support whereby said cavity is caused to cover and enclose the end of an opening in said piece of lumber, means for moving said member away from said support, means for moving said member towards said support and into engagement with said piece whereby a chamber is formed over the end of said opening, a source of filling material under pressure, a passage through said member for conducting filling material from said source into said chamber, a normally closed valve means in said passage, said valve having a valve stem projecting from said member in the direction of said lumber and engaged by the surface of said lumber following initial engagement of said member with said lumber for effecting opening of said valve, and means for closing said valve in advance of complete withdrawal of said member from engagement with said piece.

16. Apparatus for filling holes and the like in lumber which comprises conduit means for engaging with a portion of one surface of the lumber in surrounding relation with respect to the corresponding end of an opening extending through said lumber, means for moving said conduit means into engagement with one surface of said lumber to effect a substantial seal between the periphery of said conduit and said surface, means for feeding filling material into said conduit means, means for applying high pressure to said material to cause said material to fill said opening, and means for supporting the surface of said lumber opposite said conduit means including means for restricting the flow of said material from the opposite end of said opening.

GERHARD F. NEILS.