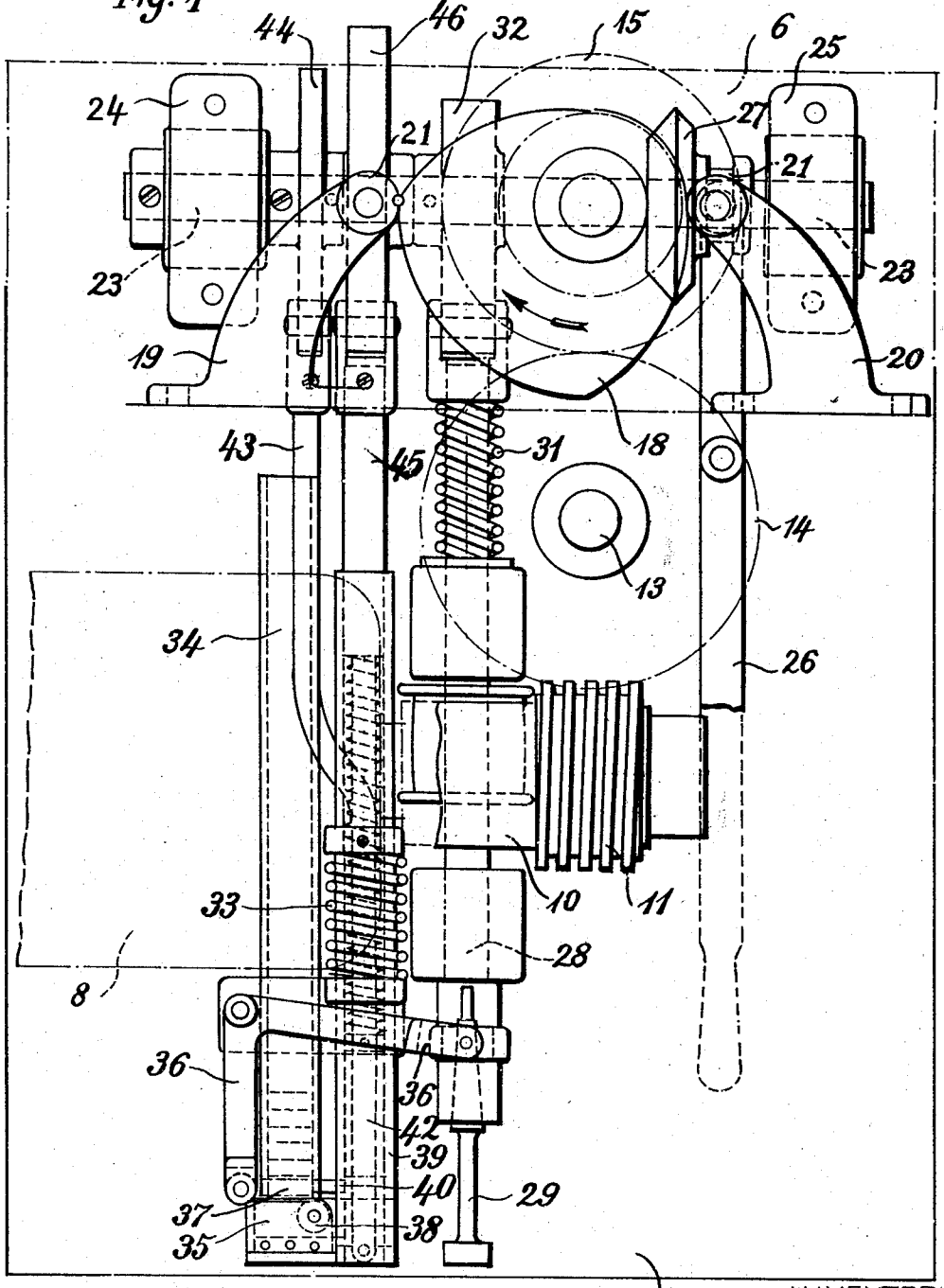
Dec. 29, 1931. G. MAURER 1,838,426

KNOT REMOVING AND REPAIRING MACHINE

Filed July 10, 1930 4 Sheets-Sheet 1

Fig. 1



INVENTOR.
Gottfried Maurer

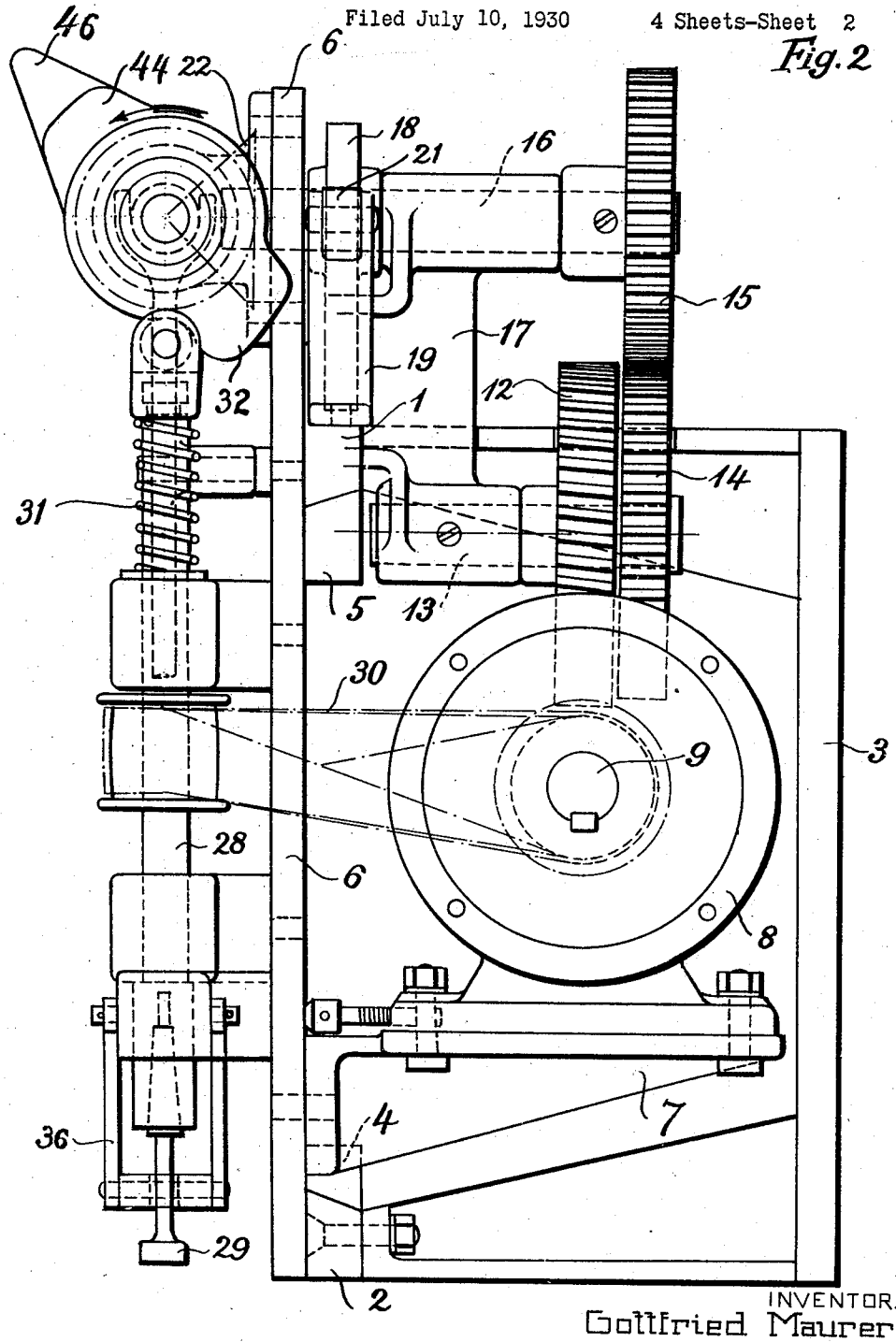
BY Lancaster, Allwine and Rommel
ATTORNEYS.

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Fig. 2



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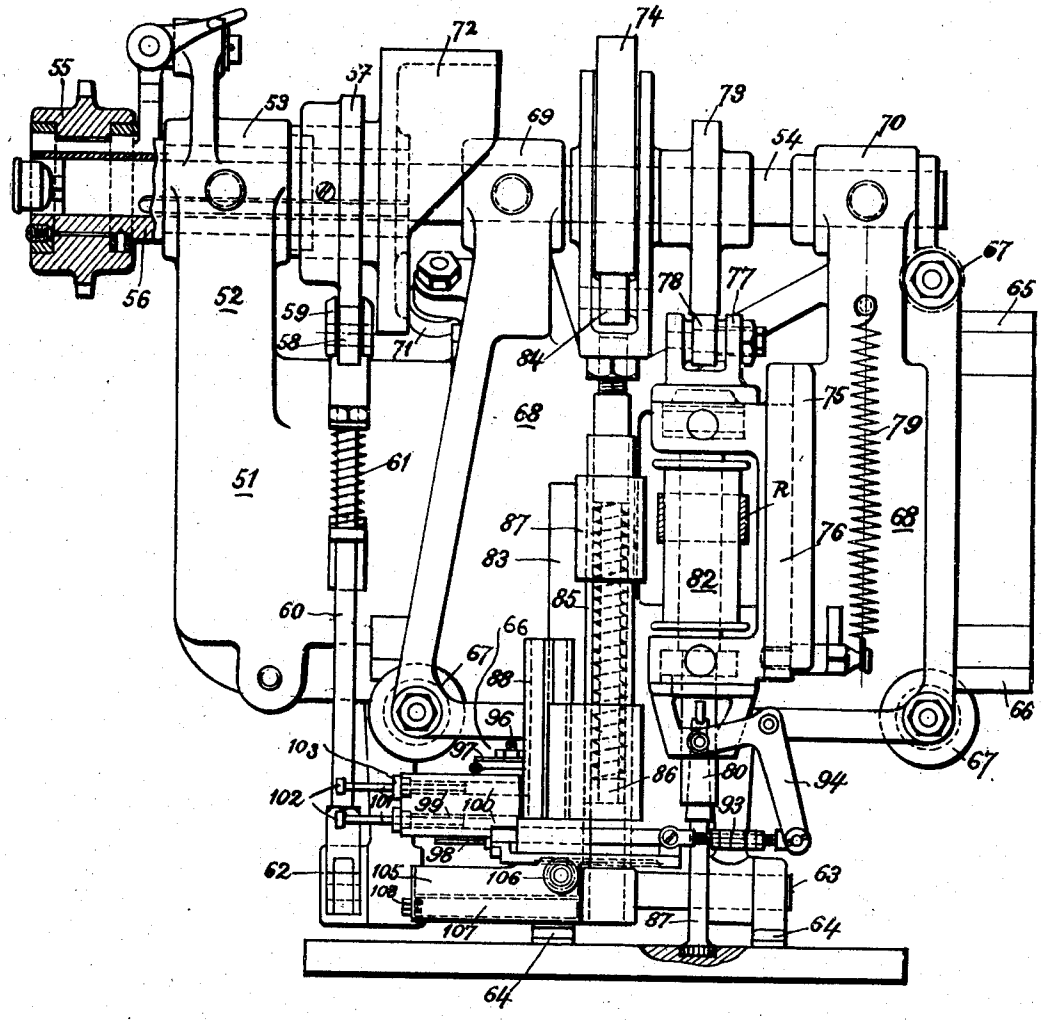


Fig. 3

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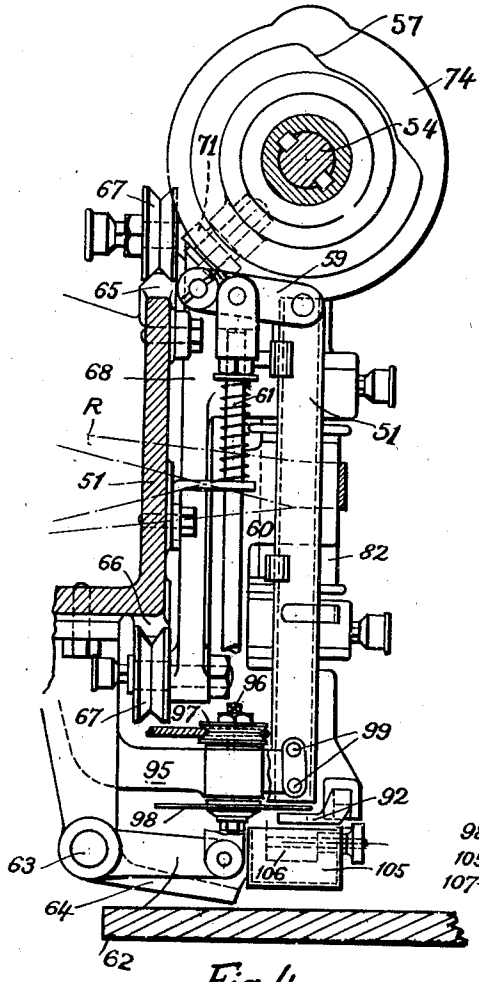


Fig. 4

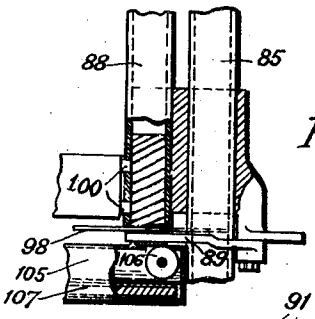


Fig. 5

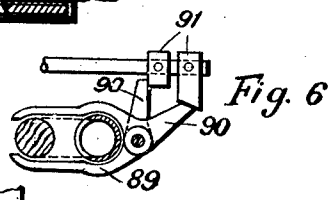


Fig. 6

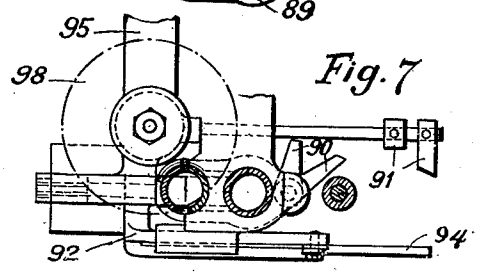


Fig. 7

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Patented Dec. 29, 1931 1,838,426

UNITED STATES PATENT OFFICE

GOTTFRIED MAURER, OF ZURICH, SWITZERLAND

KNOT REMOVING AND REPAIRING MACHINE

Application filed July 10, 1930, Serial No. 467,027, and in Switzerland July 11, 1929.

I have filed applications for patents in Switzerland, July 11, 1929, and May 3, 1930; Germany, May 10, 1930; Austria, May 13, 1930; France, May 16, 1930; Belgium, May 22, 1930; Czechoslovakia, May 26, 1930; Portugal, May 27, 1930; Spain, May 31, 1930; Denmark, May 31, 1930; Sweden, June 6, 1930; England, June 12, 1930; Norway, June 13, 1930.

This invention relates to an improved machine for the automatic extraction of knots from boards, and the insertion of a filler in the knot-hole.

The primary object of the invention is the provision of an improved machine which will bore knots out of boards, in an efficient relation, and automatically glue and place a filler plug of wood in the hole in the board left after removal of the knot.

Other objects and advantages of this invention will be apparent during the course of the following detailed description.

In the accompanying drawings, forming part of this specification, and wherein similar reference characters designate corresponding parts throughout the several views,

Figure 1 is a front view of a preferred type of machine for removing knots and filling the holes left thereby.

Figure 2 is a side view of the machine shown in Figure 1.

Figure 3 is a front view of a modified form of apparatus for removing knots and placing filler blocks in the openings left thereby.

Figure 4 is a side view, partly in section, of the modified machine.

Figure 5 is a fragmentary view, partly in section, showing the device for applying glue to the filler block.

Figure 6 is a sectional view showing tongs for holding the wooden block for placement thereof in a pressing-in device.

Figure 7 is a fragmentary view, partly in section, showing the relation in which the tongs of Figure 6 hold the wooden block with respect to a saw.

Referring to the form of invention shown in Figures 1 and 2 of the drawings, the machine consists of a stand or frame 3 having parallel guide rails 1 and 2 connected therewith, upon which a vertically positioned carriage 6 slides horizontally, having blocks 4 and 5 connected therewith and sliding on the beveled surfaces of the rails 1 and 2, as shown in Figure 2.

The carriage 6 is provided with a fixed bracket 7 upon which a motor 8 is mounted. The shaft 9 of the motor has a worm 11 keyed therewith, and also a pulley 10. A worm wheel 12, meshing with the worm 11, is keyed upon a shaft 13 rotatably supported in a suitable bearing upon a bracket 17 fixed with the carriage. This shaft 13 is also provided with a spur gear wheel 14 meshing with a second gear 15 rotatably mounted upon a shaft 16. The shaft 16 rotates in suitable bearings in the bracket 17, as shown in Figure 2.

An eccentric or cam 18 is keyed on the shaft 16, rotating in the direction of the arrow shown in Figure 1; the same being located between relative convergent brackets or supports 19 and 20, fixed upon the frame 3. These supports 19 and 20 are provided with rollers 21 at the free ends, between which the cam 18 operates, so that the outer periphery will engage the rollers and cause a reciprocation of the carriage 6 upon the frame 3, during rotation of the shaft 16.

The carriage 6 is provided upon the front side thereof with a horizontal shaft 23, rotating in bearings 24 and 25 affixed to the carriage. A bevel gear 27 is splined upon the shaft 23, being moved into or out of engagement with a bevel gear 22 keyed on the shaft 16, by means of an operating lever 26, which is pivoted on the carriage, intermediate its ends, as shown in Figure 1.

There is positioned upon the front of the carriage 6 a bore spindle 28, vertically disposed, having a suitable chuck for detachably receiving a drill bit or knot hole borer 29. This spindle 28 is rotatably supported in suitable brackets or bearings, and is directly driven from the motor 8 by means of a belt 30 which passes through an opening in the carriage 6; the belt 30 operating on the pulley 10 above mentioned, and over a pulley keyed to the spindle 28, as shown in Figure 2. This spindle 28 is normally held

in its highest position by means of a spiral spring 31. Its depression is brought about by means of an eccentric or cam 32, keyed on the shaft 23, which operates over a roller or other device placed at the top of the spindle 28.

Adjacent to the bore spindle 28 is located a device for inserting a wooden filler block in the board hole. This device, called a pressing-in device, designated at 33, includes a tubular vertically disposed container 34, receiving the filler blocks in a stacked relation. The container 34 at its lower end is provided with a glue-pot 35, as shown in Figure 1. Operatively associated with the spindle 28, container 34, and the glue-pot, is a bell crank lever 36, which is swivelly connected at one end to the spindle 28, and at the opposite end is pivotally connected to a reciprocating member 37 operating across the lower end of the container 34. Upon retraction of the bore spindle 28, it is to be noted that the bell crank lever 36 is rocked upon its pivot, so that the lowermost block in the magazine or container 34 is pushed by the slide 37 into the lower end of the jacket of the pressing-in device 33. During its passage from the magazine 34 into the jacket of the pressing-in device, the block guides over a roller 38 mounted in the glue pot 35. This roller partially dips into the glue in the pot 35, and is peripherally coated with glue. As the lowermost filler block rides over the roller 38, it is apparent that the under-surface is coated with the glue.

As soon as the bit 29 has left the bore-hole, the carriage 6, under action of the eccentric 18, is laterally displaced to the right, in such manner that the lower end of the jacket 39 of the pressing-in device 33 comes to a position directly over the bored hole.

As before mentioned, the pressing-in device 33 includes the jacket 39, having a slit or lateral opening 40, through which the filler block is inserted by the slide 37. Operating in the jacket 39 is a piston 42. The jacket 39, as well as the piston 42, are pressed by individual springs, shown in Figure 1, so that they are normally urged upwardly. A press rod 43 acts upon the jacket 39; being activated by an eccentric 44 keyed upon the shaft 23. A press rod 45 acts upon the piston 42; being activated by an eccentric 46 keyed upon the shaft 23, as shown in Figure 1.

At about the same time that the carriage 6 is moved by the eccentric 18, the press rod 43 commences to depress the jacket 39, through action of the eccentric 44, and the pressing-in device is thus lowered so that it comes to rest on a piece of board to be treated, as soon as the lateral displacement of the carriage has ended. The eccentric 46 then comes into play and presses the rod 45 downwardly, so that the piston 42 presses the block in the lower end of the jacket 39 out of the jacket and into the previously bored hole in the board. This block is of a diameter corresponding to that of the bored hole, and is pressed in by the piston 42, and glued in place. The piston 42, as well as the jacket 39, then return to their initial positions, by reason of spring action, since the eccentrics are out of the way.

Referring to the modified form of invention shown in Figures 3 to 7 inclusive, the same is automatically functionable, the same as the preferred form, but in addition the modified device saws off the block from a bar of wood supported upon the machine. It is possible with this modified machine to always insert the wooden block with the direction of the fiber corresponding to that of the board to be treated. In addition, in the modified device there is provided holding means for maintaining the board to be treated rigid during treatment, and eliminating manual effort upon the part of the operator in this connection.

The modified form of machine includes a frame 51 provided with an upstanding bracket arm 52 having a bearing 53 rotatably bearing a horizontal shaft 54. The shaft 54 has a sprocket wheel 55 rotatable thereon, which is provided with a clutch 56 that may be connected and disconnected during operation. This sprocket wheel 55 is driven through reduction gearing; the latter being operated by means of a suitable motor (not shown), supported in any approved manner upon the frame 51.

The shaft 54 has an eccentric or cam 57 keyed therewith, operating upon a roller 58 carried by a lever 59. The lever 59 is supported at one end upon the frame 51, as shown in Figure 4. The lever 59 intermediate its ends is connected to a press rod 60 suitably reciprocably supported upon the frame 51. It has a spring 61 normally urging it upward The rod 60 in turn activates a lever 62, oscillating a shaft 63 mounted upon the frame 51, as shown in the drawings. This shaft 63 is provided with clamping fingers 64, shown in the lower part of Figure 4, which press against the piece of work to be treated, for holding it against the work table, in a manner which is perfectly apparent.

A carriage 68 is provided, movable upon the frame 51. The latter is provided with tapered guide rails 65 and 66, over which rollers 67, supported by the carriage 68, operate to enable the carriage to move horizontally back and forth on the frame 51 in a definite path. This carriage is provided with bearings 69 and 70, supporting the shaft 54 and sliding thereon in a manner which is apparent. The carriage 68 is provided with a roller 71 operating upon the cam edge of a cylinder-like member 72 which is keyed on the shaft 54, as shown in Figure 3. This cam

edge faces longitudinally of the shaft. A suitable spring device urges the carriage 68 in the direction of the cylinder cam 72.

The shaft 54 is provided with eccentrics 73 and 74, splined thereon, and held between the bearings 69 and 70 in a definite relation therewith.

The carriage 68 is provided with a guide flange 75, receiving a slide 76. This slide 76 is vertically reciprocable and at its upper end rotatably supports a roller 78, acted upon by the eccentric 73 above mentioned. The slide is normally urged upwardly by a spring 79. This slide rotatably carries a vertical bore spindle 80, which at the lower end is provided with a suitable chuck for receiving a drill bit 81. It has a pulley 82 operated by means of a belt R, driven direct from the motor carried by the frame 51.

The carriage 68 is provided with a device for sawing off, glue-coating, and pressing the filler block into the hole bored by the bit 81. This device is supported upon a slide 83, which is vertically displaceable upon the carriage 68 in the same manner as above described for the slide 76. The slide 83 has a roller 84 at its upper end upon which the eccentric 74 operates; being normally urged upwardly by any approved spring device.

The device for pressing in the wooden filler block consists of a jacket 85, fixed with the slide 83, wherein a piston 86 operates for pressing in the filler block. This piston is normally spring urged downwardly. The action of the eccentric 74 is such that initially the whole slide 83 is lowered, including the jacket 85, until the latter comes to rest upon the work, thereafter the piston 86 is further lowered for causing the pressing-in action.

A vertical tubular jacket 88 holds a wooden bar, from which the filler blocks are to be cut. The internal diameter is equal to that of the bored hole.

Beneath the jacket 85 there is disposed a tong or clamping device 89, the gripping ends of which engage upon the lower end of the wooden bar protruding from the jacket 88. The tong shanks have projections 90, against which members 91 operate during movement of the carriage 68 to effect a closing of the tongs 89. The slide 92, having a curvature of 180°, operates upon a suitable guide carried by the pressing-in device. It is connected by an adjustable turn-buckle 93 with a bell crank lever 94 mounted upon the carriage 68. The opposite end of the bell crank lever 94 is connected with the spindle supporting slide 76, and by movement of the same the slide 92 is drawn between the shanks of the tong 89 for pushing a filler block into the tong 89 in clamping position.

The frame 51 has a support 95 vertically supporting a shaft 96 upon a fixed axis. This shaft has a circular saw blade 98 keyed therewith, and is provided with a pulley 97 upon which a belt operates; being driven from any suitable source. The saw blade 98 lies beneath the jacket 88 before lateral displacement of the carriage 68 commences. The frame attached support 95 is provided with horizontal guide passageways 99 wherein a pair of plungers 100 are guided, see Figure 3. These plungers each include guide rods 101, having enlarged outer heads 102. They are guided through suitable glands or screws 103, closing the outer ends of the openings 99, as shown in Figure 3. The pistons 100 are normally pressed, by suitable springs in the passageways 99, against the wooden bar in the jacket 88, as shown in Figure 5; the jacket 88 being provided with suitable openings for receiving the ends of the plungers to enable this operation, which secures the bar in proper position against movement. Due to the action of their springs the pistons 100 follow a lateral displacement of the carriage 68, until the heads 102 come into engagement with the screws 103, and upon continued lateral movement of the carriage, the wooden bar is released, permitting the wooden plug in the jacket 88 to drop.

The pressing-in device, beneath the jacket 88 is provided with a glue-pot 105, wherein a roller 106 is operatively mounted for dipping into the glue. The lower part 107 of the glue-pot contains an electric heating device, which by means of an ordinary plug contact and cord can be attached to a light socket.

The operation of the improved machine just described is substantially as follows:—

The bore spindle 80 is rotated by the motor (not shown), and the board is laid upon the work-table so that the knot to be removed and replaced by a filler block lies directly under the drill bit 81. The clutch 56 is thrown into engagement with the sprocket wheel 55, and the shaft 54 commences to rotate slowly. The eccentric 57 at once acts upon the pressing rod 60 to clamp the clamping fingers 64 for holding the work against the table. The eccentric 73 then depresses the slide 76, and of course the blade of the drill bit bores the knot from the piece of work. The slide 92 is activated by lowering of the bore spindle, through the bell crank lever 94 just described, and pushes the filler block from the jacket 88 into the tong 89 beneath the pressing-in piston of the jacket 85. During this act the tong is slightly open. The filler block as it moves over the roller 106 is dipped into the glue on its undersurface. As soon as the drill bit blade has left the piece of work, the cam edge of the carriage displacing cam 72 operates upon the roller 71 to move the carriage to the extent that the pressing-in device comes to rest directly over the hole just bored. As the bore spindle ascends, the slide 92 is again drawn

back by means of the bell crank lever 94, and the pistons 100 are then released as above described, permitting the bar of wood in the jacket 88 to release and fall until it comes to rest on the cover of the glue container 105. The projections 90 on the shanks of the tong 89 strike against the members 91 fastened to the frame 51, as shown in Figure 6, closing the tong 89 for grasping the wooden bar in the jacket 88. As soon as the lateral displacement of the carriage is complete, the eccentric 74 operates the pressing-in device. First, the whole device descends until it rests upon the treated board, thereafter the carriage 6 further descends for pushing the filler block into the hole just bored. After this the eccentric 74 releases the pressing-in device, and under spring action it is raised. When the pressing-in device is at its highest position the cam 72 releases the carriage 68, which under action of its springs returns the carriage to the left. In the course of retraction of the carriage the circular saw-blade 98 engages the lower end of the bar of wood projecting from the jacket 88, cutting off the next filler block, which is held by the tongs 89 in position for a succeeding operation. Thereafter the eccentric 57 releases the clamping fingers 64, and at this moment the clutch 56 is disengaged. The operation is thus completed and the machine is again in initial position.

Various changes in the shape, size, and arrangement of parts may be made to the forms of invention herein shown and described, without departing from the spirit of the invention or the scope of the claims.

I claim:

1. In a machine of the class described the combination of a frame, a movable carriage on the frame, a boring device on the carriage, means for operating the boring device for boring a hole in a piece of work, a filler block dispensing device, means operated by the boring device for ejecting a filler block from the filler block dispensing device, means automatically operable after boring of a hole to move the filler block dispensing device so that the filler block ejected lies over the hole immediately bored by said boring device, and means for forcing said filler block into said hole.

2. In a machine of the class described the combination of a frame, a movable carriage on the frame, a boring device on the carriage, means for operating the boring device for boring a hole in a piece of work, a filler block dispensing device, means operated by the boring device for ejecting a filler block from the filler block dispensing device, means automatically operable after boring of a hole to move the filler block dispensing device so that the filler block ejected lies over the hole immediately bored by said boring device, means for forcing said filler block into said hole, and means for gluing said block as it is ejected into position upon retraction of the boring device.

3. In a machine of the class described the combination of a stationary frame, a carriage movable on the stationary frame, a reciprocatory boring device on the carriage, means for rotating the boring device for boring a hole, means for operating the reciprocatory boring device longitudinally for boring a hole in a piece of work and retracting thereafter, a magazine receiving a plurality of filler blocks, a pressing-in device, means connected with the boring device for ejecting a filler block from the magazine into the pressing-in device, means for automatically moving the carriage after a boring operation for moving the pressing-in device so that the filler block is over the opening bored in the board, and means for thereafter operating the pressing-in device to press the block of wood into the bored opening.

4. In a machine of the class described the combination of a stationary frame, a carriage movable on the stationary frame, a reciprocatory boring device on the carriage, means for rotating the boring device for boring a hole, means for operating the reciprocatory boring device longitudinally for boring a hole in a piece of work and retracting thereafter, a magazine receiving a plurality of filler blocks, a pressing-in device, means connected with the boring device for ejecting a filler block from the magazine into the pressing-in device, means for automatically moving the carriage after a boring operation for moving the pressing-in device so that the filler block is over the opening bored in the board, means for thereafter operating the pressing-in device to press the block of wood into the bored opening, and means for automatically applying glue to the filler block in its passage from the magazine to the pressing-in device.

5. In a machine of the class described the combination of a supporting frame, a carriage slidable on the frame, a rotatable and reciprocatory boring device for boring holes in a piece of work, a magazine for supporting a piece of wood from which filler blocks are to be cut, means for moving the carriage, sawing means for removing a filler block from the piece of wood upon movement of the carriage in a predetermined direction, means for receiving said filler block as it is sawed from the piece of wood, means connected with the boring device for moving the filler block to a predetermined position as the boring device is moved to perform a boring operation, means for moving the carriage so that the filler block in the last mentioned position is automatically moved over the hole bored in the work succeeding the boring operation, and means for pressing the filler block into the hole bored by the boring device.

6. In a machine of the class described the combination of a supporting frame, a car-

riage slidable on the frame, a rotatable and reciprocatory boring device for boring holes in a piece of work, a magazine for supporting a piece of wood from which filler blocks are to be removed, means for moving the carriage, sawing means for removing a filler block from the piece of wood upon movement of the carriage in a predetermined direction, means for receiving said filler block as it is sawed from the piece of wood, means connected with the boring device for moving the filler block to a predetermined position as the boring device is moved to perform a boring operation, means for moving the carriage so that the filler block in the last mentioned position is automatically moved over the hole bored in the work succeeding the boring operation, means for pressing the filler block into the hole bored by the boring device, and means for gluing the filler block as it is moved during the boring operation.

7. In a repairing machine of the class described the combination of a frame, a carriage reciprocable upon the frame, a motor carried by the frame, horizontal shafts, eccentrics upon the shafts, means for driving the shafts by means of said motor, a bore spindle carried by the carriage, means for operating the bore spindle from an eccentric, and means operated by another eccentric for inserting a filler block into a bored hole.

8. In a machine for removing knots from boards and for repairing the latter the combination of a supporting frame, a rotary boring device mounted on the frame, means for moving said rotary boring device into operative or inoperative positions with respect to a board mounted upon the supporting frame, a filler block magazine having a plurality of filler blocks therein, and means operatively connected with the rotary boring device for placing a filler block from the magazine in the opening left in the board incidental to an operation of the rotary boring device.

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