United States Patent [19]

Whitney

[11] **3,768,140**

[45] **Oct. 30, 1973**

[54] **MACHINE FOR AND METHOD OF CHANGING WOODEN FRAMING MEMBERS INTO PREFORMED AND BOUND UNITS**

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[52] **U.S. Cl.** ..... **29/429,** 29/200 A

[51] **Int. Cl.** **B23p 19/00**

[58] **Field of Search** ..... 29/429, 430, 431, 29/200 A, 200 R, 200 P, 208 D

[56] **References Cited**

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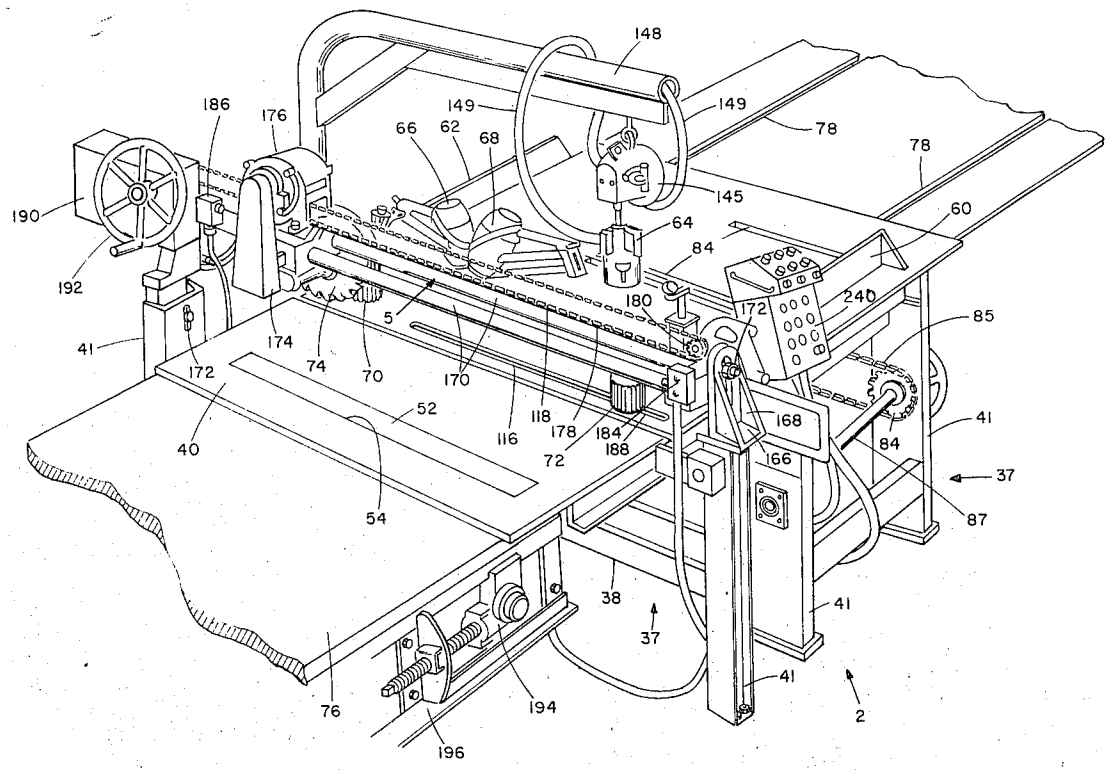
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Primary Examiner—Thomas H. Eager
Attorney—Warren H. F. Schmieding

[57] **ABSTRACT**

The method of and a machine for changing wooden framing members into preformed and bound units, the method comprising moving layers of wood members along a table, compacting the members horizontally and vertically, fixing them to one another, then sawing through a layer or layers of framing members and moving the same off the table.

21 Claims, 18 Drawing Figures



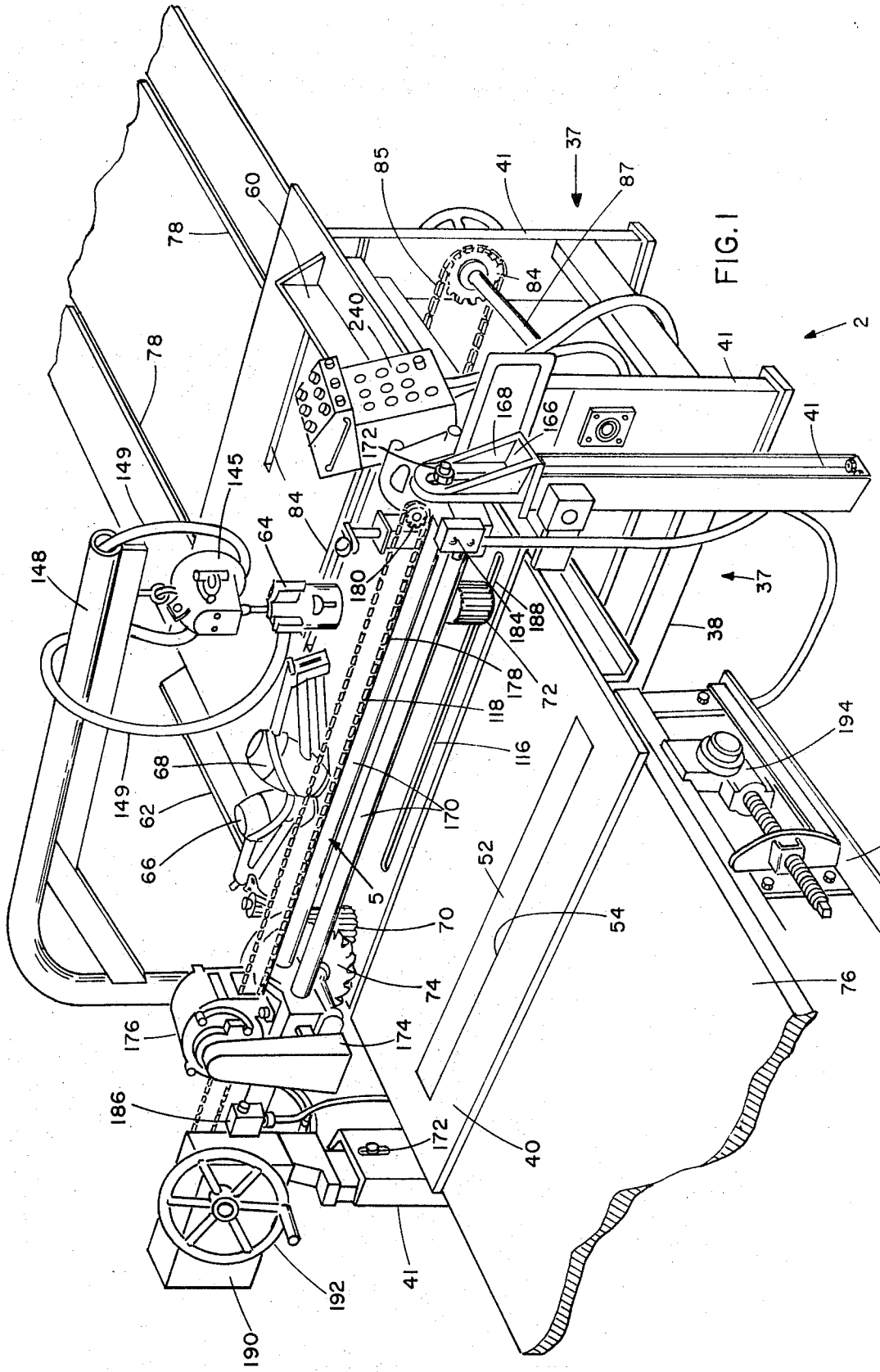

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FIG. 1

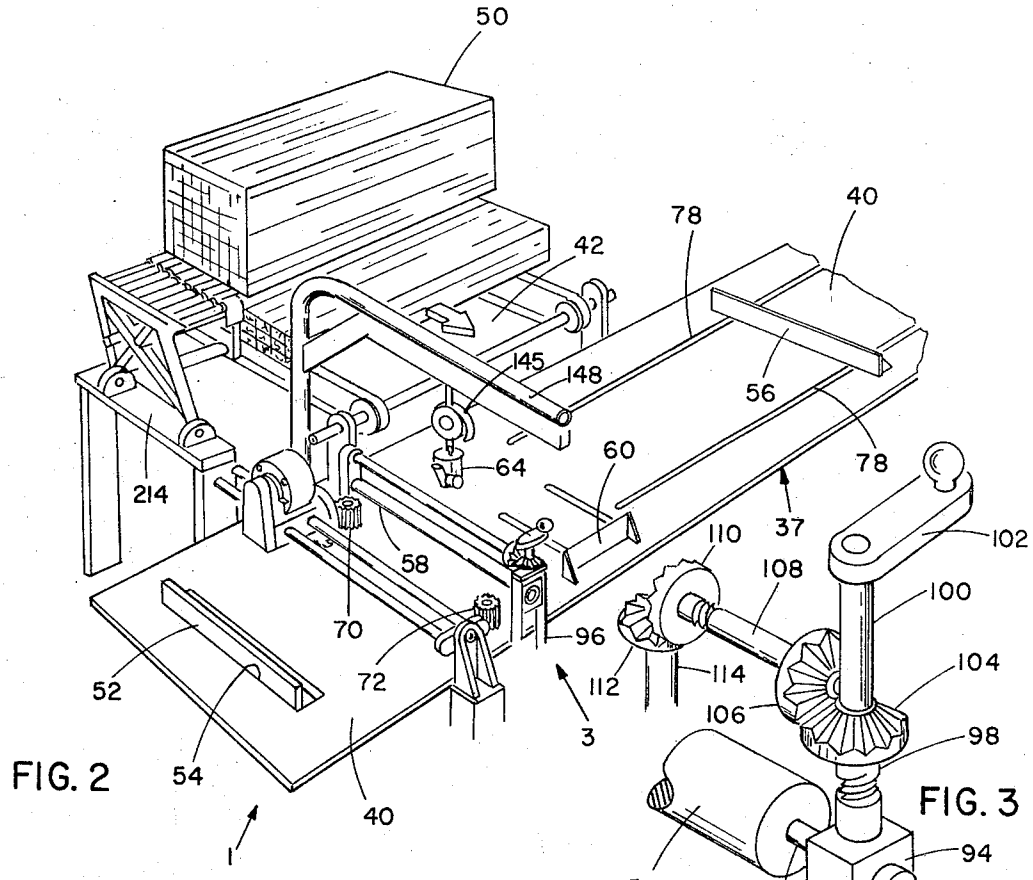


FIG. 2

FIG. 3

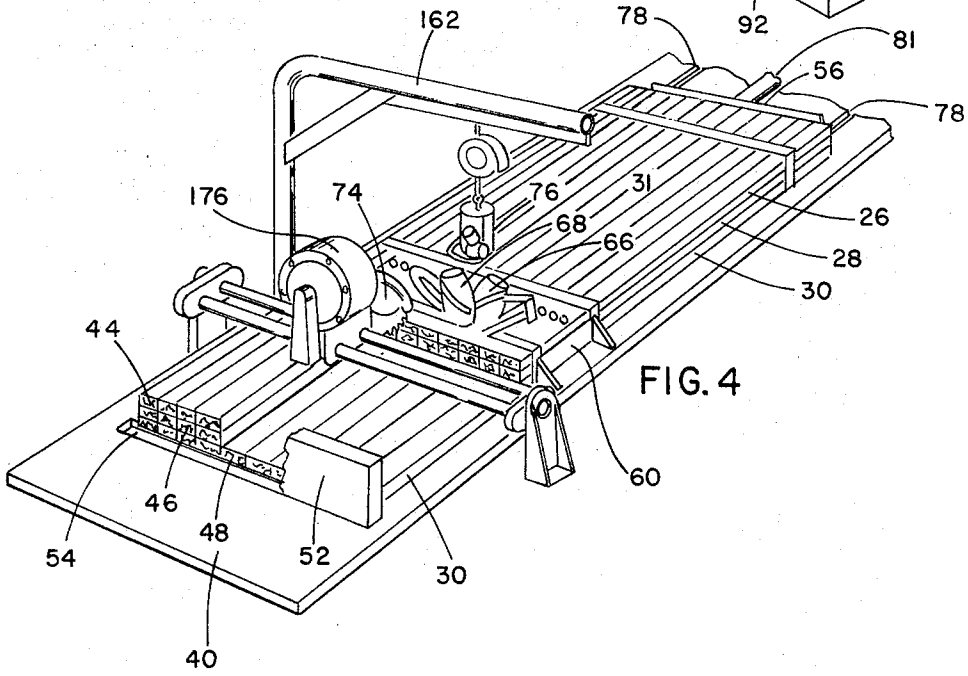


FIG. 4

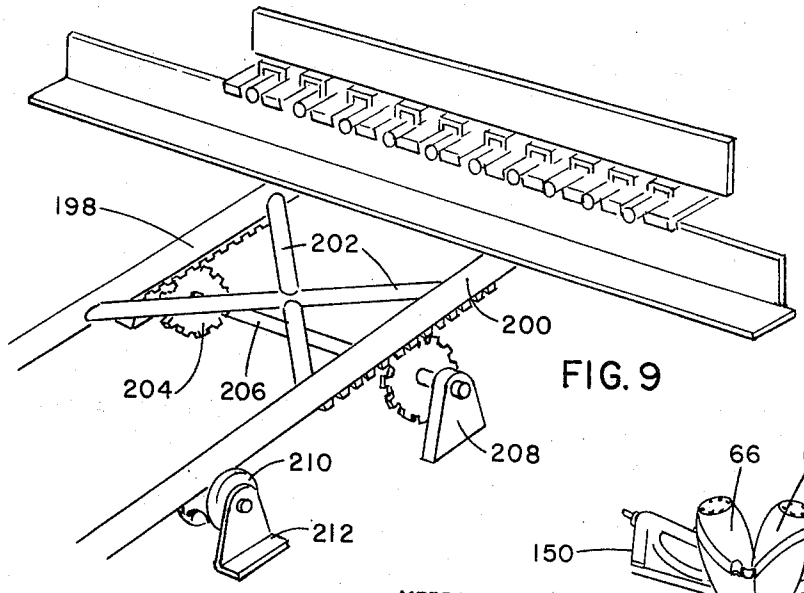


FIG. 9

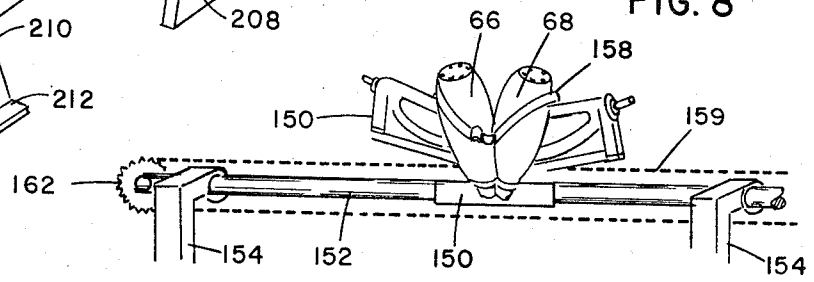


FIG. 8

FIG. 5

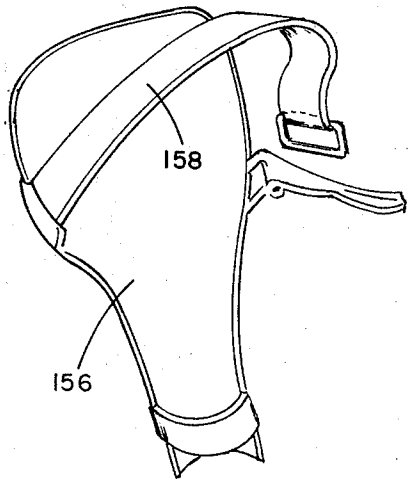


FIG. 6

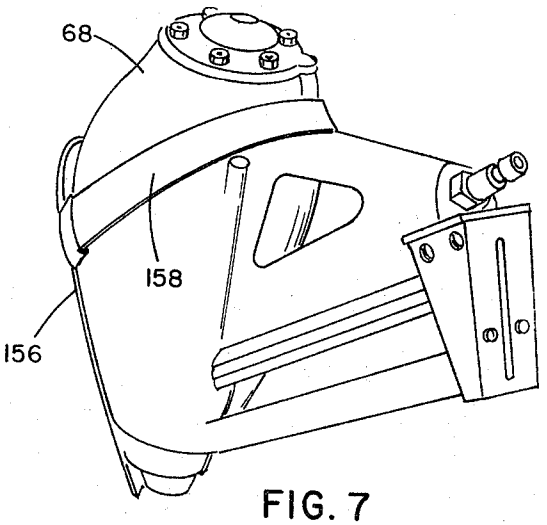


FIG. 7

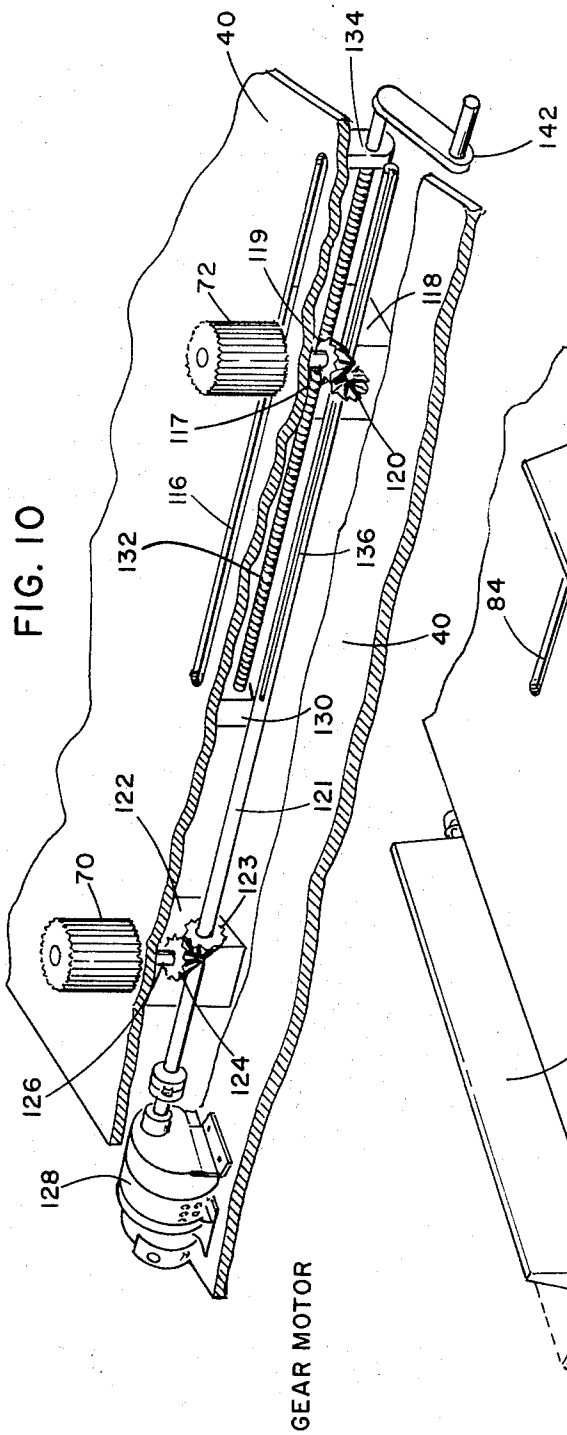

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GEAR MOTOR

FIG. 10

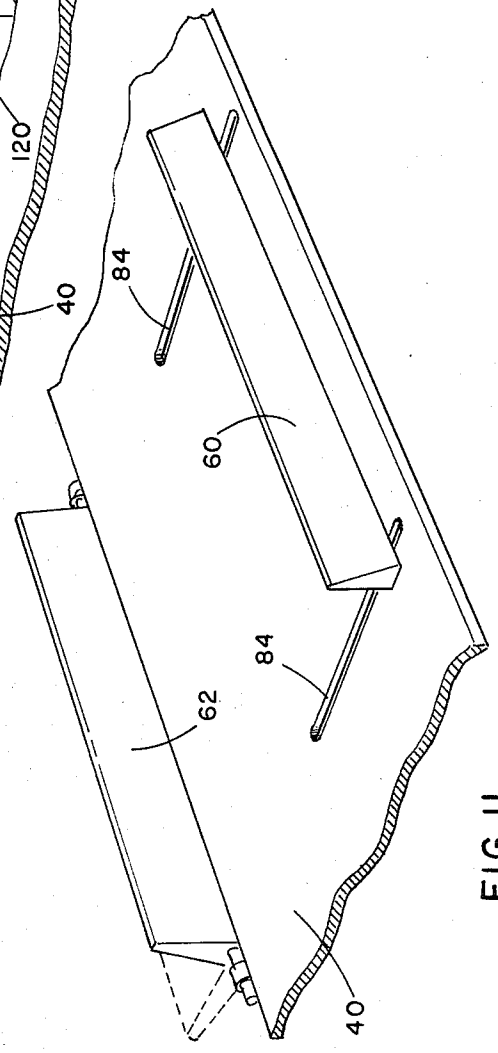

84
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FIG. 11

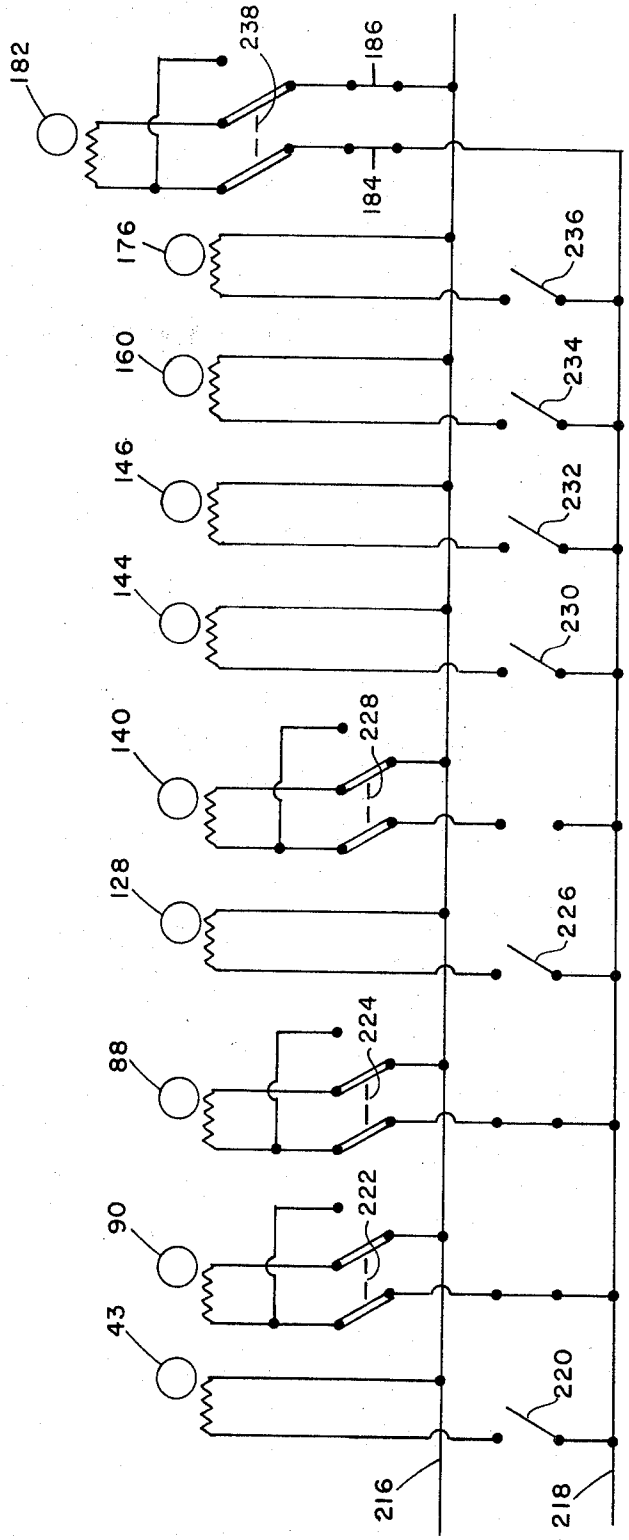

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FIG. 12

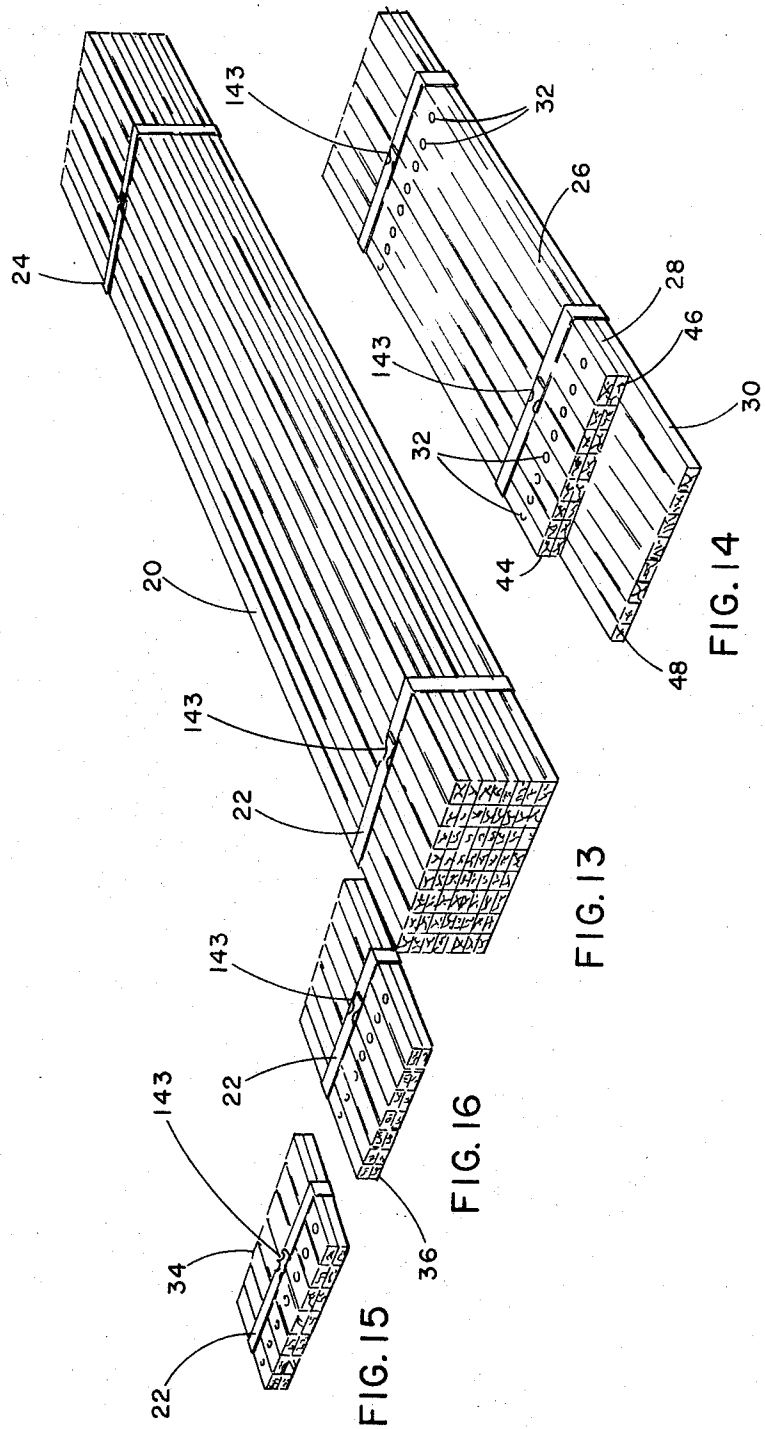


FIG. 14

FIG. 13

FIG. 16

FIG. 15

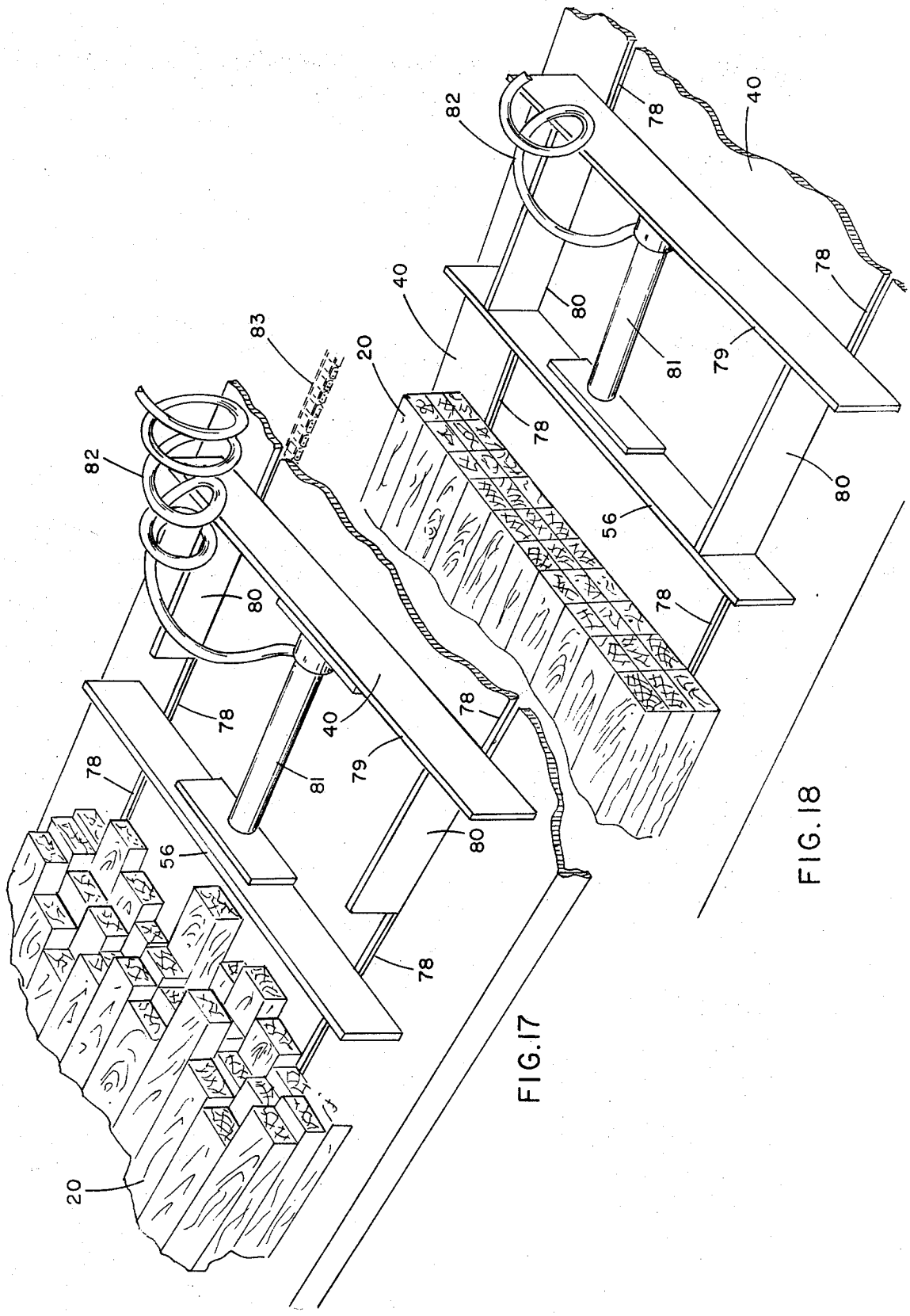


FIG. 17

FIG. 18

MACHINE FOR AND METHOD OF CHANGING WOODEN FRAMING MEMBERS INTO PREFORMED AND BOUND UNITS

CROSS REFERENCE TO RELATED APPLICATION

The present invention includes improvements over certain parts of a copending application, Ser. No. 267,582 filed June 29, 1972, which application is a continuation of Ser. No. 120,894 filed Mar. 4, 1971, now abandoned.

BACKGROUND OF THE INVENTION

1. Field of the Invention:

The invention is directed to a machine for and a method of changing wooden framing members into pre-formed and bound units.

2. Description of the Prior Art:

To applicant's knowledge there is no anticipating art.

SUMMARY OF THE INVENTION

A frame forms a table for receiving layers of framing members. A pusher engages like ends of all of the framing members to move the framing members lengthwise toward a gate. The framing members are compacted horizontally and vertically. When so compacted, they are banded and then nailed to one another. Mechanism, disposed on opposite sides of the bound layers, moves the unit of framing members against the gate. Then a saw is activated to trim the framing members so that all are of the same length. The saw can also be activated to saw through, for example, two layers of a three-layer unit. The gate is then moved out of the path of movement of the unit, and the unit is then removed from the table.

Other features and the advantages of the present invention will be apparent from the following description, reference being made to the accompanying drawings, wherein a preferred embodiment of the invention is illustrated.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a fragmentary, perspective view of the machine looking in the direction of arrow 1 of FIG. 2;

FIG. 2 is a fragmentary, perspective view looking in the direction of arrow 2 of FIG. 1, some of the parts shown in FIG. 1 being omitted, but showing the stack of framing members from which the layers of framing members are withdrawn and showing part of the mechanism for removing the bottom layer of framing members;

FIG. 3 is a fragmentary, perspective view looking in the direction of arrow 3 of FIG. 2, but on a larger scale;

FIG. 4 is a fragmentary, perspective view showing the table with layers of framing members thereon, the framing members being banded and nailed and showing the position of the saw as it is cutting part of two of the layers of framing members;

FIG. 5 is a view of the two nailing machines looking in the direction of arrow 5 of FIG. 1, and showing the frame for slideably supporting the nailing machine and the chain for moving the nailing machine along the frame;

FIG. 6 is a perspective view of one of the holsters for supporting a nailing machine;

FIG. 7 is a perspective view of a nailing machine in its supporting holster;

FIG. 8 is a schematic view of the carriage and the mechanism for moving the nailing machines transversely, i.e. over the table;

FIG. 9 is a schematic view of part of the machine for withdrawing layers of framing members from stacked framing members;

FIG. 10 is a fragmentary, schematic, and perspective view of the mechanism for advancing layers of framing members toward the gate;

FIG. 11 is a fragmentary, schematic, and perspective view of the pusher that compacts the framing members horizontally;

FIG. 12 is a diagrammatic view of motors and controls therefor;

FIG. 13 is a perspective view of layers of framing members that have been banded;

FIG. 14 is a perspective view of layers of framing members in which the ends of the two upper layers have been removed, and also showing the layers being nailed to one another;

FIGS. 15 and 16 are perspective views, respectively, of banded and nailed cripplers and sills or headers; and

FIG. 17 is a perspective view of one of the pushers and the jack for activating the same; and

FIG. 18 is a perspective view of the pusher shown in FIG. 17, but the pusher has been retracted merely for the purpose of showing the results in the alignment of the rear ends of the framing members by action of the jack.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring first to FIG. 13, it shows layers of framing members 20, herein shown for illustrative purpose as studs, that have been cut to desired length and banded to one another by bands 22 and 24 by the machine of the present invention. These framing members are in the form of cripplers, plates, mudsills, king studs, trimmers, etc., for buildings such as houses. In FIG. 14, three layers of framing members 26, 28 and 30 have been banded to one another by bands 22 and 24 and nailed to one another by sixteen-penny nails, the tops of which are shown at 32. A section of the two top layers has been removed by a saw of the present invention. FIG. 15 shows cripplers 34 which have been preformed to the desired length, banded, and nailed to one another. FIG. 16 shows sills or headers 36 which have been pre-formed to desired length, banded, and nailed to one another.

In general, the machine 37 includes a main frame 38 that supports an elongated table 40 which is suitably supported by a plurality of legs or posts 41. As seen in FIG. 2, a conveyor 42, which is actuated by a motor 43, shown diagrammatically in FIG. 12, delivers layers of framing members 26, 28 and 30 onto the table 40. Each layer includes, for example, three stacked framing members 44, 46 and 48. These three layers of framing members can be withdrawn from a stack 50 of framing members (see FIG. 2) by mechanism that is shown and described in the copending application of Whitney, et al., Ser. No. 120,894 filed Mar. 4, 1971. The conveyor 42 extends below the stack of framing members and receives the layers of framing members.

A motor-actuated gate 52 extends upwardly through a slot 54 in the table 40. This slot and gate are disposed at right angles with respect to the elongated table. A motor-actuated pusher 56 extends at right angles with

respect to the elongated table and is adapted to engage one of the rear ends of each of the framing members on the table. This pusher pushes all of the framing members part way to the gate and, in doing so, aligns those ends of the framing members.

The pusher **56,** while pushing all of the framing members toward the gate, causes the framing members to pass below a roller **58** that lies parallel to the pusher. The roller is disposed so that it compacts the layers of framing members vertically. A second motor-actuated pusher **60** lies at right angles to the framing members and, simultaneously with the movement of the framing members lengthwise of the table, it pushes the layers of framing members against pivotally mounted abutment **62** that lies lengthwise along one edge of the table. The pusher **60** engages one side of all of the layers of framing members. The other side of the layers of framing members is pushed against the abutment **62** whereby, upon pushing movement of pusher **60,** all of the framing members are compacted horizontally.

After being compacted vertically and horizontally, the layers of framing members are banded to one another by a banding machine **64.** Under certain conditions, the layers of framing members are nailed to one another by two nailing machines **66** and **68.** After the layers of framing members are banded and/or nailed, they are no longer pushed by the pusher **56,** but are advanced by power-operated, knurled rollers **70** and **72** that rotate about vertical axes, one engaging one of the outer sides of all of the layers of framing members and the other engaging the opposite outer side of all of the layers of framing members.

When it is necessary to trim the opposite ends of the layers of framing members to assure that they are all of the same length, the forward movement by the knurled rollers is stopped when the framing members are in a pre-selected position, and then an electric motor-actuated, rotatable saw **74** is moved transversely of the table to trim all of the opposite ends of the layers of framing members.

When it is desirable to form layers of framing members as shown in FIG. **14,** then the pushing rollers **70** and **72** push the ends of the framing members against the gate **52.** Then the saw **74** is rendered operable to saw through the two top layers of framing members, i.e. framing members **44** and **46** are sawed through.

In either event, i.e. after the trimming or sawing through the two top layers of framing members, the gate is moved to a non-abutting position; and the rollers **70** and **72** are reactivated to push the bound layers of framing members lengthwise along the table and onto a belt-type conveyor **76.**

Specifically, the table **40** is provided with two parallel slots **78,** which extend longitudinally of the table. A frame **79** has portions **80** that extend from below the table **40** upwardly through the slots **78,** and the front thereof carries the pusher **56.** The frame carries a pneumatically actuated jack **81** of the type that causes the ram thereof to effect vibratory movement. Air is supplied to the jack **81** through a coiled hose **82.** When the frame is moving forwardly, it imparts vibratory movement to the rear ends of the layers of framing members to aligne the rear ends of those members. They are shown aligned in FIG. **18.** The frame **79** has been withdrawn on FIG. **18,** merely for the purpose of showing the ends of the aligned framing members. It is to be understood that after the rear ends of the framing members have been aligned, the frame is not retracted but is continuously moved forward to push the frame forwardly. The frame is moved forwardly by a pair of endless chains, one of which is shown at **83.** The frame **79** is moved rearwardly by the same chains after all of the framing members have been moved forwardly a predetermined distance.

The table **40** is provided with two parallel slots **84** (see FIGS. **1** and **11**) which are disposed at right angles to the length of the table. The pusher **60** is guided by these slots **84** and is actuated by chain drive, a portion of which is shown in FIG. **1,** the chain being indicated at **85.** One of the two sprockets **86** of the chain drive is driven by a shaft **87.** This chain drive is actuated by a reversible motor **88** shown diagrammatically in FIG. **12.**

The chain drive for the frame **79** is the same type as that shown with respect to the chain drive for the pusher **60,** and it is driven by a reversible motor **90** which is also shown diagrammatically in FIG. **12.** A motor **89** is shown diagrammatically in FIG. **12;** it drives a compressor (not shown) for feeding air through the hose **82** to the jack **81.**

The abutment is locked in vertical position as shown in FIG. **11** and is turned to the dotted line position when the layers of framing members are moved from conveyor **42** to the top of table **40.**

As previously stated, while the pusher **56** is moving the layers of framing members toward the gate **52,** the pusher **60** is actuated for compacting the framing members horizontally. As is more clearly shown in FIG. **2,** while the pusher **56** is pushing the framing members toward the gate, they are pushed below and downwardly by the roller **58.** This action is simultaneous with the pushing of the pusher **60.** As seen more clearly in FIG. **3,** the roller **58** is carried by shaft **92** which is journaled in blocks **94.** The blocks **94** are guided by vertically extending guides **96.** Blocks **94** and guides **96** are disposed on opposite sides of the table, and these blocks are guided by guides **96.** The blocks **94** can be raised and lowered by a screw **98** which is part of a shaft **100.** The shaft is turned by a handle **102.** The shaft **100** carries a bevel gear **104** which meshes with a bevel gear **106.** The bevel gear **106** is fixed to a horizontally extending shaft **108** which, in turn, is fixed to a bevel gear **110.** Gear **110** meshes with a gear **112** that is fixed to a shaft **114.** Shaft **114** and an integrally formed screw **115** functions the same as shaft **100** and screw **98,** but the screw is connected to the block on the opposite side of the table. By turning the crank, the entire length of the roller **58** can be raised or lowered. By lowering the roller its compacting is increased. Thus, the roller is used for compacting the framing members vertically.

A slot **116** is disposed parallelly with the slots **84** that are at right angles with respect to the length of the table.

The shaft **117** for the knurled, motor-powered roller **72** extends through the slot **116** and is journaled in a bearing block **118** that is slideably mounted parallelly with slot **116** and along the underside of table **40.** A bevel gear **119** is fixed to the shaft and is disposed in the bearing block **118.** Bevel gear **119** meshes with a bevel gear **120.** Gear **120** is driven by a horizontally disposed shaft **121.** Shaft **121** is journaled in the bearing block. A bearing block **122** is fixed to the underside of the table **40** adjacent the left side of the table, as viewed in FIG. **10.** A bevel gear **123** is disposed in

block 122 and is fixed to shaft 121. A bevel gear 124 meshes with the bevel gear 123 and drives knurled roller 70 through a vertical shaft 126. Shaft 126 is driven through speed-reducing gears in an electric motor 128.

A bearing block 130 is fixed to the underside of the table 40. The left end of a horizontally extending, travel-imparting screw 132 is journaled in block 130. The screw 132 is threaded through bearing block 118, and the right end of the screw is journaled in a bearing block 134 that is also fixed to the underside of table 40. The shaft 121 is provided with a longitudinal keyway 136 which receives a parallel key (not shown) that is fixed to the block 118. The block can be moved through the slot 116 as by a motor 140 that rotates the screw, such motor being shown diagrammati-cally in FIG. 12, or it can be rotated by a crank 142.

While the layers of framing members are being compacted horizontally and vertically, the standard type banding machine 64 is brought into operation to tighten the unit and crimp the ends of the bands together. The motor for the banding machine is shown diagrammatically in FIG. 12 at 144. These crimps are shown at 143.

The bander 64 is raised and lowered by a spring-loaded balancer and is suspended from a hollow frame 148 that is carried by the main frame 38. The cable 149 for the wires extends through the hollow frame 148. These wires control the crimping action of the bander 64.

After the banding machine crimps several sets of bands, the nailing machines 66 and 68 are rendered operative to drive the nails downward through the layers of framing members.

Referring specifically to FIGS. 6, 7 and 8, the nailers 66 and 68 are carried by a saddle 150 which is slideably mounted on a shaft 152 that is carried by bearing supports 154 on the main frame 38. The saddle carries holsters 156 having straps 158. The nailers 66 and 68 are shown as strapped to the holsters 156. The holsters 156 are fixed to the saddle 150 in any suitable manner as by welding. The holsters 156 are fastened to a chain 159 which is driven by an increment-programmed motor 160 shown diagrammatically in FIG. 12. This chain travels over two sprockets, one being shown at 162. After the layers of framing members are banded, the motor 160 is brought into action to operate simultaneously and progressively transversely of the framing members to force nails of the sixteen-penny type through the framing members.

The frame 38 carries two subframes 166, one being disposed on one side of the frame and one on the opposite side, the latter not being shown. These subframes are provided with vertically extending slots 168, and they support two hollow rails 170. The rails can be adjusted vertically through the nuts 172. The rails 170 slideably carry a frame 174. The frame carries an electric motor 176 which, in turn, drives the saw 74. The frame 174 is moved along the rails 170 by a chain 178. One of the driving sprockets 180 is shown, and the sprockets are driven by a reversible-type electric motor 182 shown diagrammatically in FIG. 12. Two limit switches 184 and 186 of the type in which the contacts are resiliently biased toward one another stop the motor when it reaches either end of its travel. The motor 182 is housed in a box 190 and can be turned by a handle crank 192 to back the frame from the limit switch so as to render the motor 182 operable again.

The purpose of raising and lowering the rails 170 is to provide for governing the depth to which the saw will cut. As viewed in FIG. 1, the left side of the rails 170 can be raised and lowered by raising and lowering the box 190. It is held in adjusted position by bolts and nuts 172.

Belt 76 is adjusted by the mechanism shown at 194, like mechanism being disposed on the opposite side of the support 196 for the belt.

Referring to FIG. 9, the racks 198 and 200 are supplements for the rods 126 and 128 shown in FIG. 1 of the aforementioned application Ser. No. 120,894. These racks are interconnected by braces 202 to assure stability and rigidity between the racks 198 and 200. To further assure even movement of the racks 198 and 200, the racks are connected with pinions 204 which are fixed to a shaft 206. This shaft is carried by bearing support 208. Further, the racks are carried by rollers 210, only one of which is shown and it, in turn, is supported by a bearing plate 212. These bearing plates are supported on a frame similar to that shown at 214 in FIG. 2.

Referring specifically to FIG. 12, the electric mains for feeding electric current are shown at 216 and 218. The circuit for motor 43 for conveyor 42 is controlled by switch 220. The circuit for motor 90 for pusher 56 is controlled by switch 222. The circuit for motor 88 for pusher 60 is controlled by switch 224. The circuit for motor 128 for shaft 126 is controlled by switch 226. The circuit for the motor 140 that turns the travel-imparting screw 132 is controlled by switch 228. The circuit for motor 144 that actuates the banding machine 64 is controlled by switch 230. The circuit for motor 146 for the spring-loaded balancer 145 is controlled by switch 232. The circuit for motor 160 that actuates the increment motor is controlled by switch 234. The circuit for the saw motor 176 that rotates the saw is controlled by switch 236. The circuit for ocntrolling the reversible motor 182 that moves the saw across the table is shown as a double-pole switch 238.

The electric switches for controlling the motors are contained in a switch box 240 as shown in FIG. 1. It is to be understood that, although the switches are shown as being actuated, they can be controlled to function in sequence automatically, an example of which is illustrated in the copending application of Whitney, et al., Ser. No. 60,004 filed July 31, 1970, now abandoned.

As is well known in the art, although some of the motors are herein referred to as electric motors, it is to be understood that some of the motors may be hydraulic or air-operated motors and the switches can be valves that control the hydraulic and air motors.

From the foregoing, by virtue of the present invention, machinery has been provided for materially reducing the cost of building, for example, "track houses." In the examples shown for illustrative purpose, the builder of track houses orders framing members, mudsills and plates, cripplers, window sills, and window headers all cut to pre-determined lengths and each size being bound separately. The example in FIG. 14 also shows groups of framing members and king studs for doors being bound separately.

Having described my invention, I claim:

1. A machine for changing wooden framing members into pre-formed and bound units, said machine comprising:
A. a frame forming a table;
B. means for conveying stacked layers of framing members onto the table;
C. a vertically extending gate carried by the frame and associated with the table and disposed at a transverse angle with respect to the lengths of the framing members;
D. a motor carried by the frame for raising and lowering the gate to above and below, respectively, the top surface of the table;
E. means for pushing the layers of framing members toward the gate, said means engaging those ends of the framing members that are more remote from the gate;
F. a motor carried by the frame for actuating the pushing means;
G. means for compacting the layers of framing members horizontally, said last mentioned means including;
1. an abutment on the frame laying parallelly along one of the sides of the layers of framing members,
2. means carried by the frame and engaged with the opposite sides of the layers of framing members,
3. a motor carried by the frame for pushing the last mentioned means toward the abutment;
H. means engaging the top layer of framing members for vertically compacting the layers of framing members;
I. means for fixing the compacted layers of framing members to one another;
J. a motor carried by the frame for actuating the last named means;
K. means for conveying the fixed framing members against the gate;
L. a saw for sawing through at least one of the layers of framing members;
M. a motor carried by the frame for actuating the saw;
N. control means for selectively operating the motors.

2. A machine as defined in claim 1, characterized in that the means for fixing the layers of framing members to one another is a banding machine.

3. A machine as defined in claim 1, characterized in that the means for fixing the layers of framing members to one another is a nailing machine.

4. A machine as defined in claim 1, characterized in that the means for fixing the layers of framing members to one another are a banding machine and a nailing machine.

5. A machine as defined in claim 1, characterized in that the saw saws through the top layer of framing members.

6. A machine as defined in claim 3, characterized in that the frame includes:
O. a holster, which holster removably carries the nailing machine.

7. A machine as defined in claim 1, characterized in that the means (K) for conveying the fixed framing members against the gate is operable to push the layers of framing members beyond the gate where the top of the gate is lowered to below the surface of the table.

8. A machine as defined in claim 1, characterized in that the means (K) includes rollers bearing against the opposite sides of the framing members.

9. A machine as defined in claim 1, characterized in that the means (H) for vertically compacting the layers of framing members comprises roller means engaging the framing members of the top layer of framing members.

10. A machine as defined in claim 1, characterized in that the means (K) for conveying the fixed framing members toward the gate is operable while the means (H) is vertically compacting the layers of framing members.

11. A machine as defined in claim 1, characterized to include:
O. means for withdrawing multiple layers of framing members from a plurality of layers of vertically stacked framing members, said first mentioned means being disposed for receiving the withdrawn framing members.

12. The steps in the method of changing layers of framing members into bound units of layers of framing members, said method comprising:
A. conveying layers of framing members onto a table;
B. engaging like ends of the layers of framing members toward a frame member fixing machine;
C. vertically and horizontally compacting the layers of framing members;
D. fixing the framing members to one another by the fixing machine while they are vertically and horizontally compacted.

13. The steps in the method as defined in claim 12, characterized in that the fixing of the framing members to one another is by banding.

14. The steps in the method as defined in claim 12, characterized in that the fixing of the framing members to one another is by nailing the superimposed framing members to one another.

15. The steps in the method as defined in claim 12, characterized in that the fixing of the framing members to one another is by banding and by nailing the superimposed framing members to one another.

16. The steps in the method as defined in claim 12, characterized to include the further steps of:
E. conveying the fixed framing members toward a gate, and while the opposite ends of the framing members engage the gate,
F. severing at least some of the framing members in a layer of framing members.

17. The steps in the method as defined in claim 16, including the further steps of removing the gate and forcing the bound layers of framing members off of the table.

18. The steps in the method as defined in claim 12, including the steps of:
E. moving the fixed framing members whereby the opposite ends of the framing members engage a gate;
F. severing at least some of the framing members in a layer of framing members.

19. The steps in the method as defined in claim 18, including the further steps of removing the gate and forcing the bound layers of framing members off of the table.

20. The steps in the method as defined in claim 12, characterized to include the step of:

E. first withdrawing multiple layers of framing members from a plurality of layers of vertically stacked framing members, which withdrawn framing members are those that are conveyed to the table.

21. A machine as defined in claim **1**, characterized in that the means for pushing the layers of framing members toward the gate includes:

E. 1. a pneumatic jack for imparting vibratory movement to the ends of the framing members.

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