April 28, 1931. J. E. KALGREN 1,803,020

BOARD END MATCHING AND SAWING MACHINE

Filed Aug. 18, 1930 10 Sheets-Sheet 1

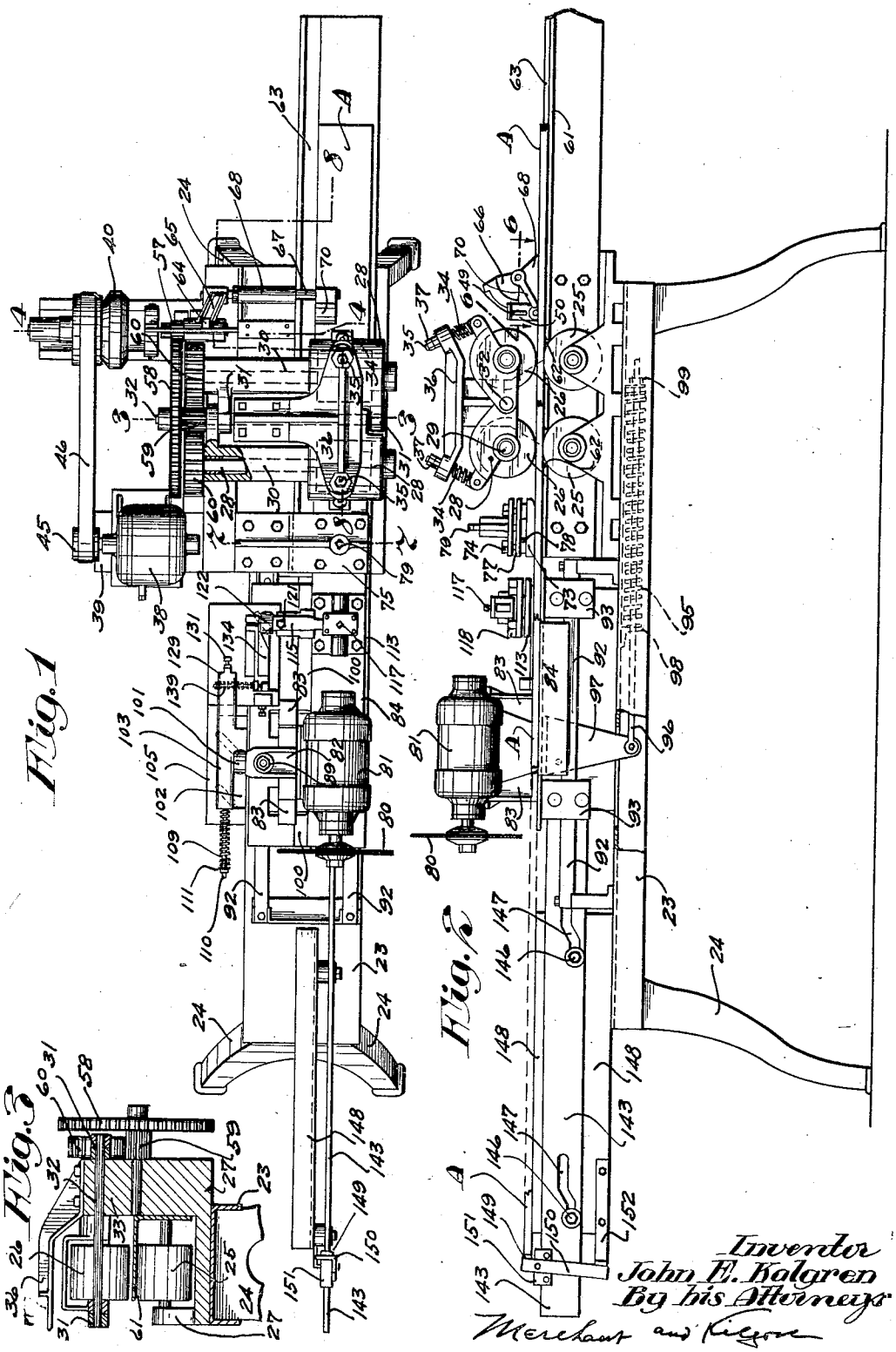


Fig. 1

Fig. 3

Fig. 2

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BOARD END MATCHING AND SAWING MACHINE

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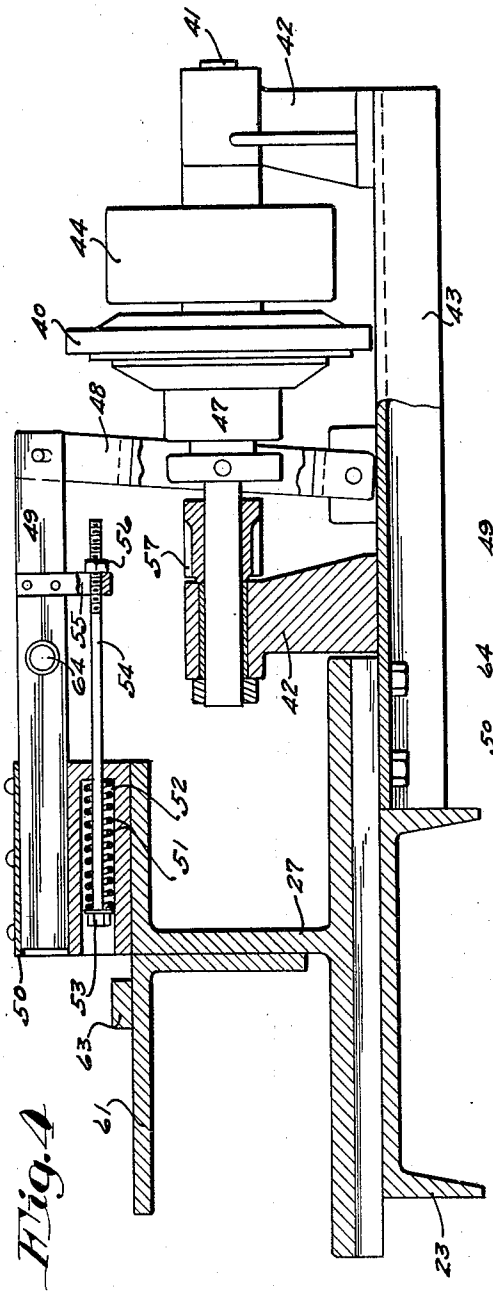


Fig. 4

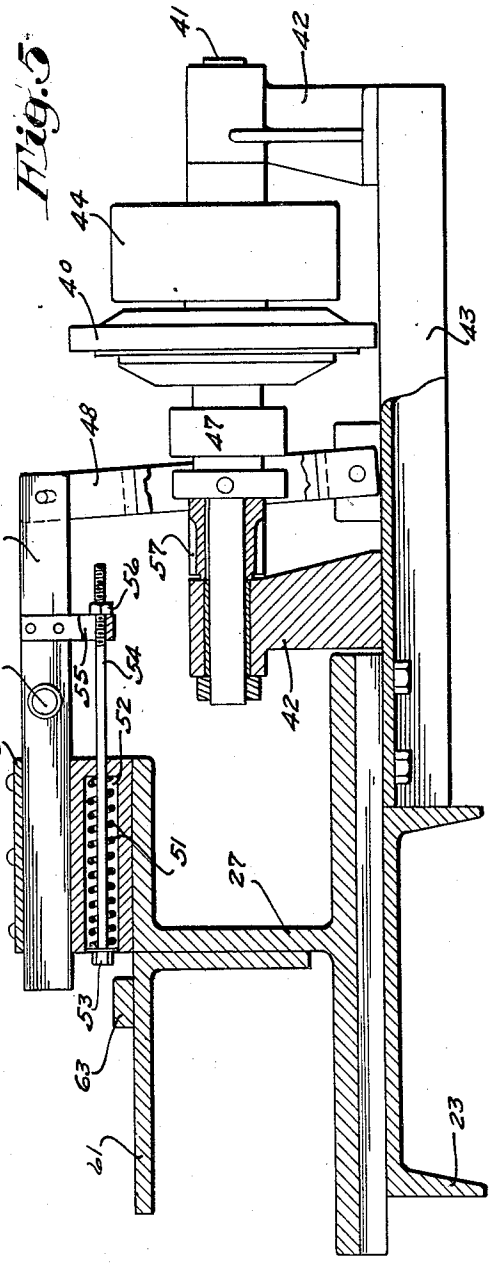


Fig. 5

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April 28, 1931. J. E. KALGREN 1,803,020

BOARD END MATCHING AND SAWING MACHINE

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Fig. 8

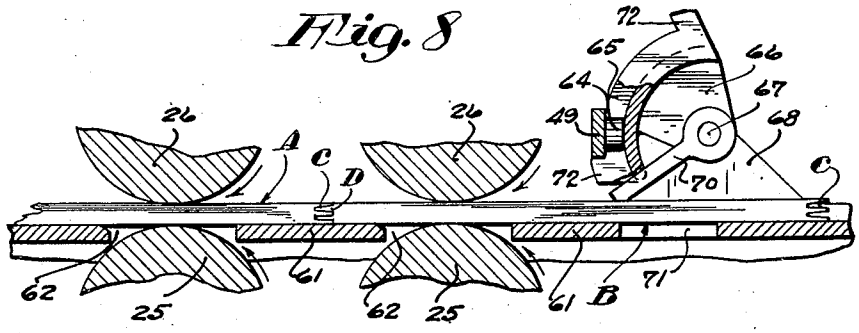


Fig. 9

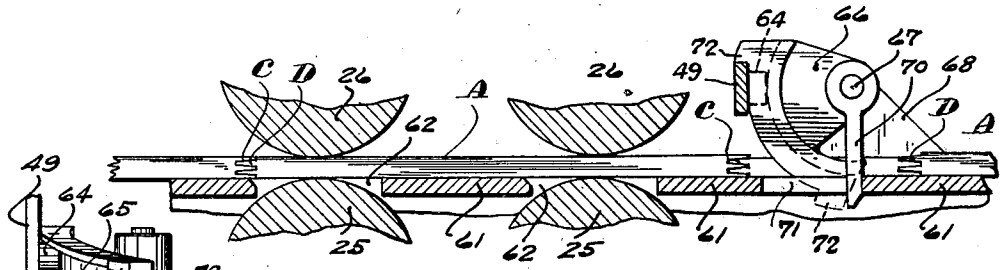


Fig. 6

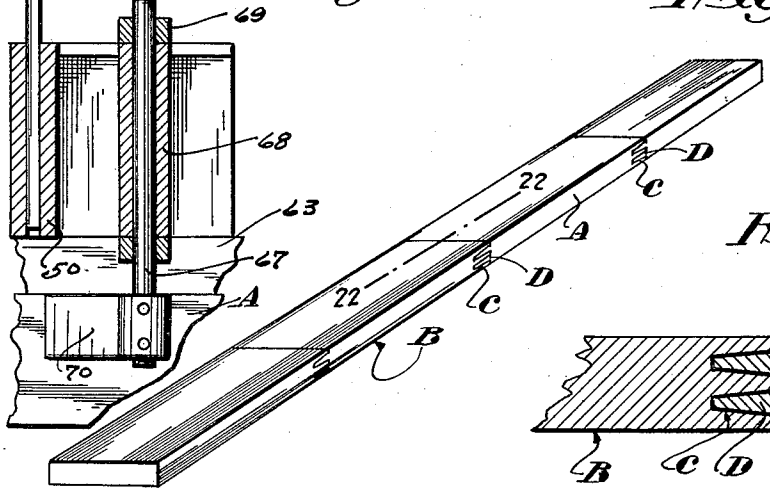


Fig. 21

Fig. 22

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April 28, 1931. J. E. KALGREN 1,803,020

BOARD END MATCHING AND SAWING MACHINE

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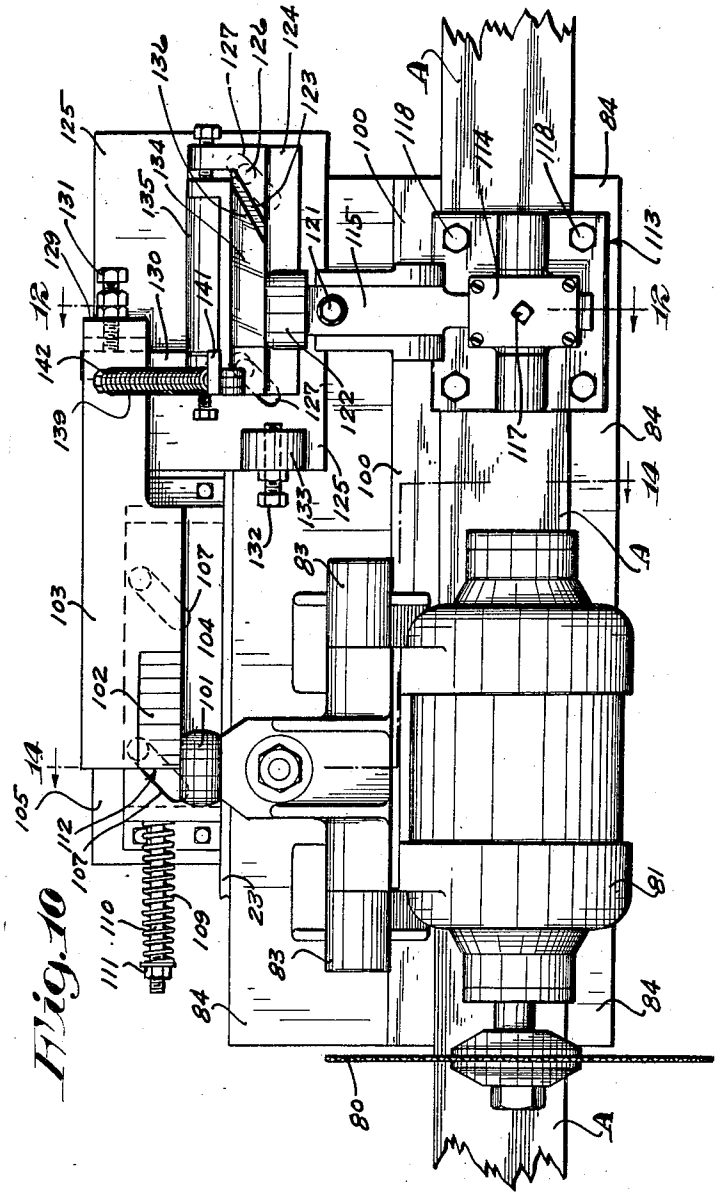


Fig. 10

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BOARD END MATCHING AND SAWING MACHINE

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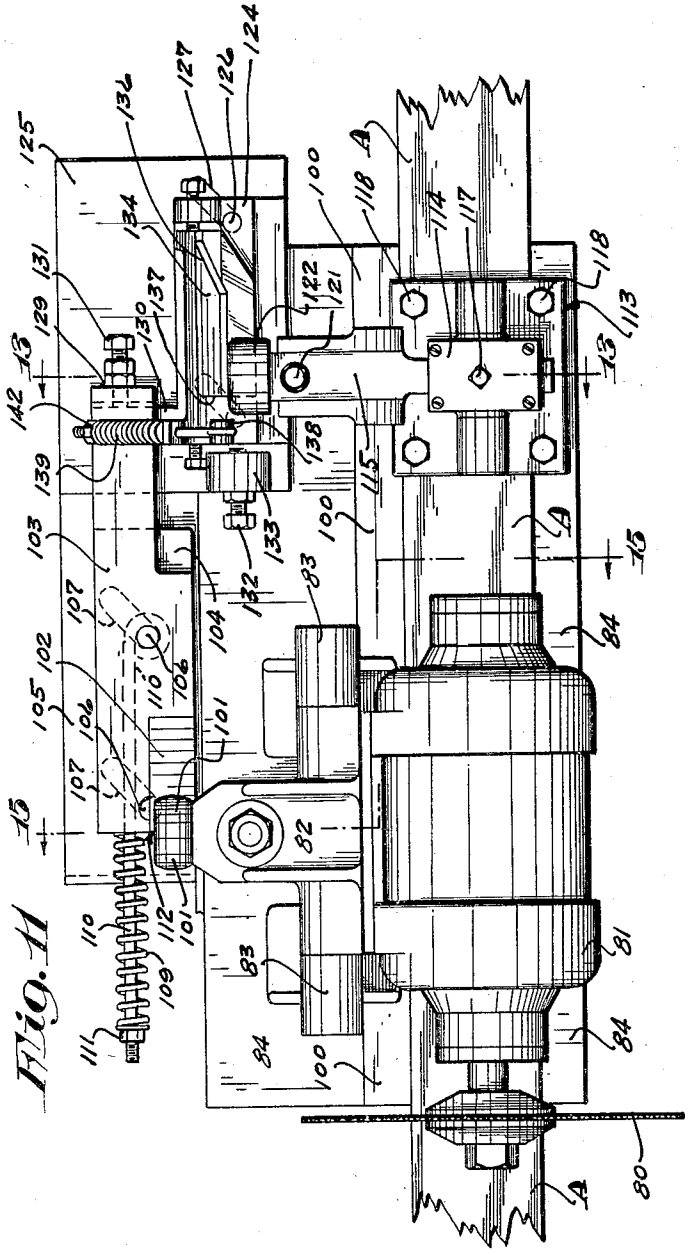


Fig. 11

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BOARD END MATCHING AND SAWING MACHINE

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Fig. 12

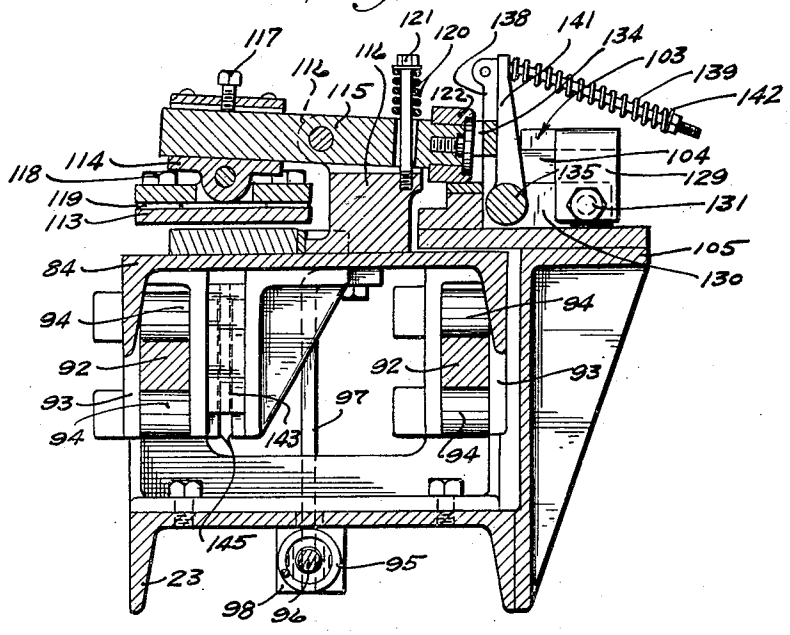
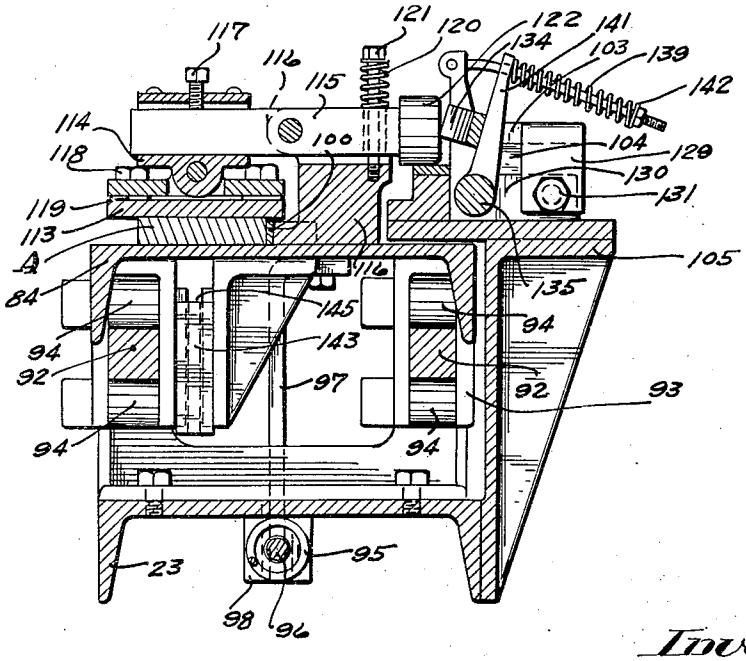


Fig. 13



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BOARD END MATCHING AND SAWING MACHINE

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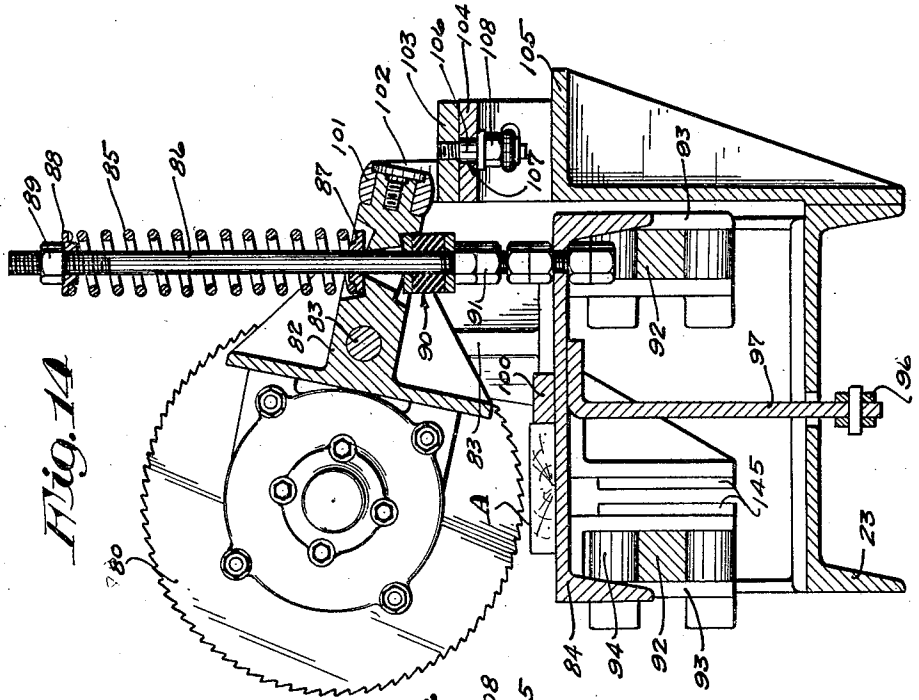


Fig. 14

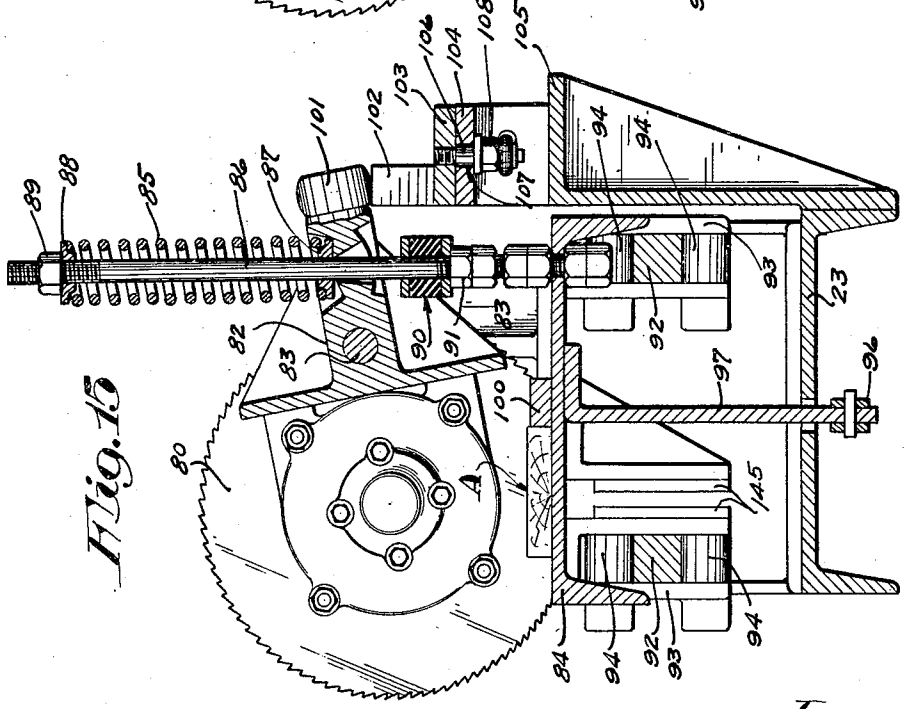


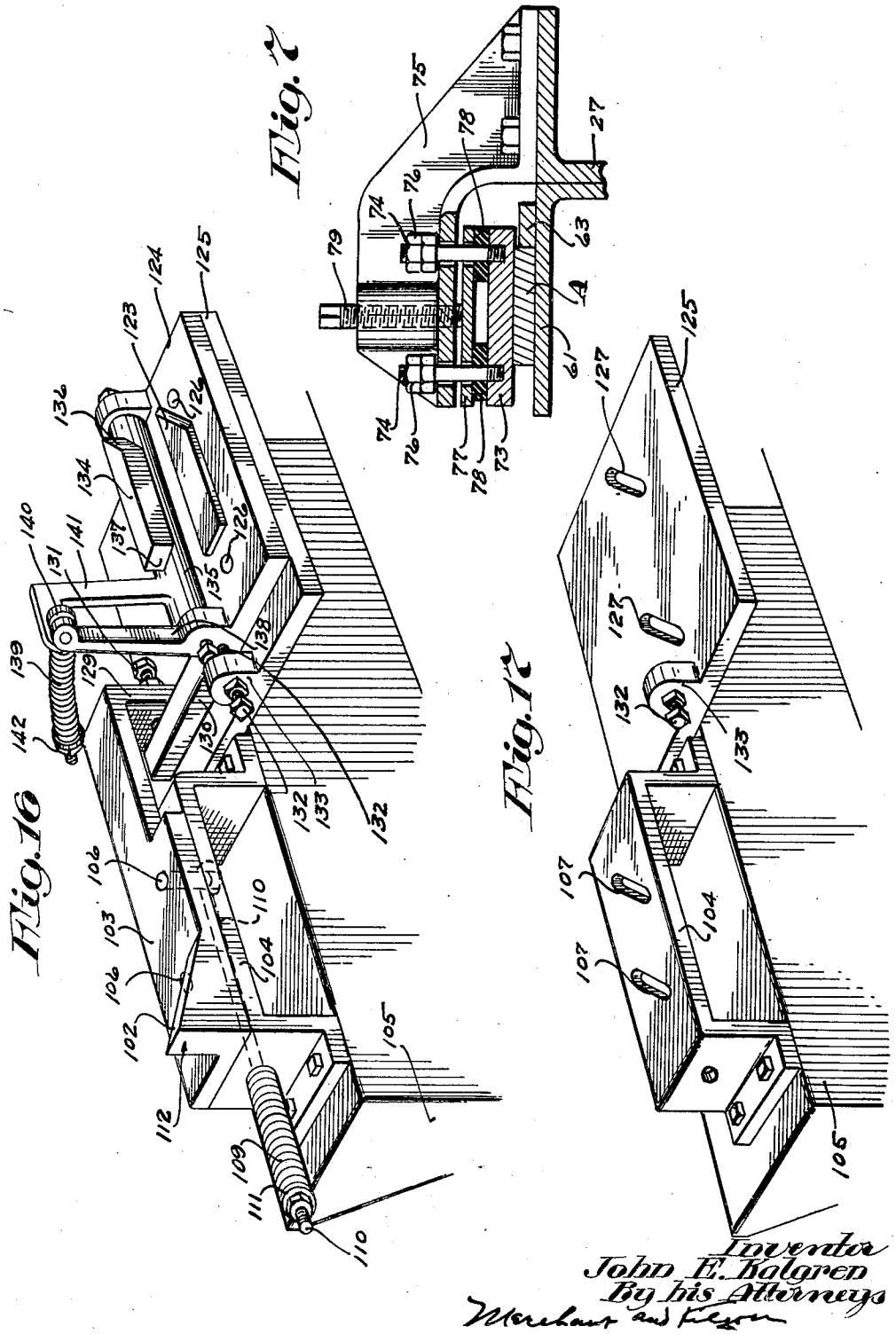
Fig. 15

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BOARD END MATCHING AND SAWING MACHINE

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BOARD END MATCHING AND SAWING MACHINE

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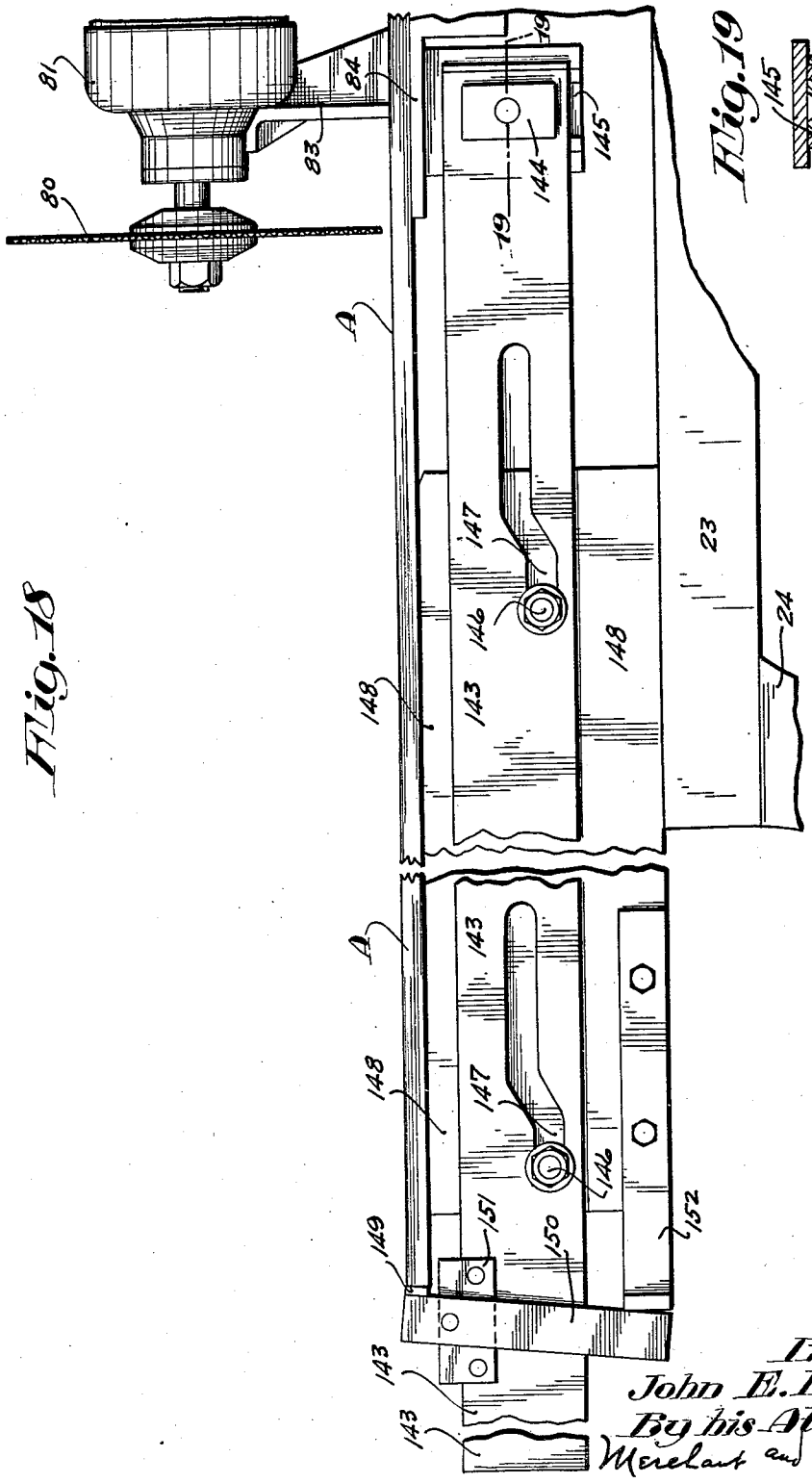


Fig. 18

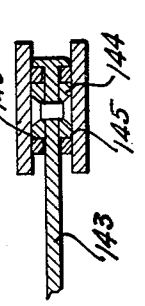


Fig. 19

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BOARD END MATCHING AND SAWING MACHINE

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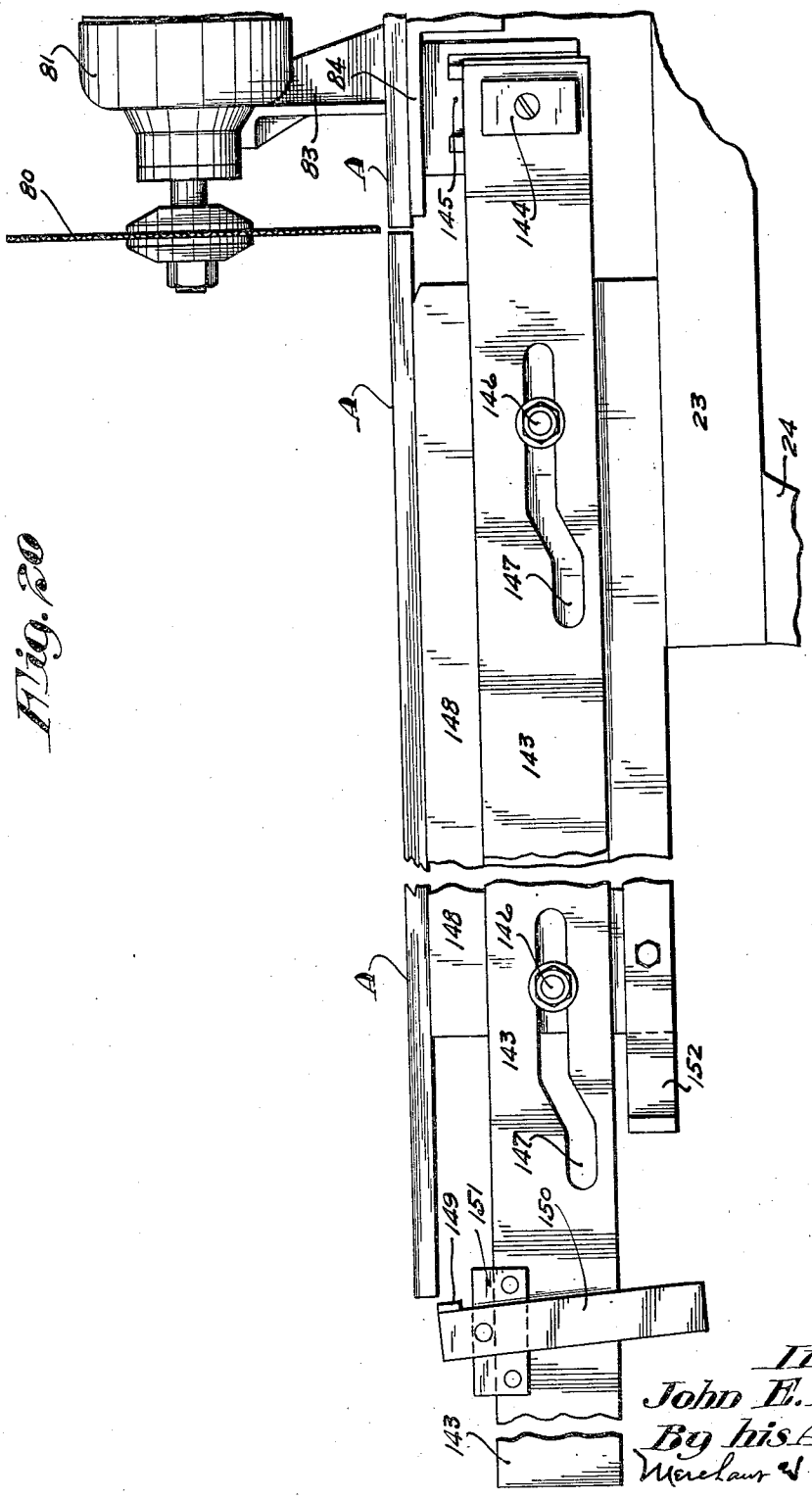


Fig. 30

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UNITED STATES PATENT OFFICE

JOHN E. KALGREN, OF MINNEAPOLIS, MINNESOTA, ASSIGNOR TO J. R. CLARK COMPANY, OF MINNEAPOLIS, MINNESOTA, A CORPORATION OF MINNESOTA

BOARD-END MATCHING AND SAWING MACHINE

Application filed August 18, 1930. Serial No. 475,874.

My present invention has for its object to provide a highly efficient machine for use in the manufacture of composite lumber of predetermined length and made up of a plurality of end matched short boards of different lengths, the joints of which are glued together.

These composite pieces of lumber as they come from the machine may be run through another machine to edgewise match and glue the same together to form pieces of composite lumber of any desired width for use in the manufacture of ironing boards, table tops and the like.

To the above end, generally stated, the invention consists of the novel devices and combinations of devices hereinafter described and defined in the claims.

In the accompanying drawings, which illustrate the invention, like characters indicate like parts throughout the several views.

Referring to the drawings:

Fig. 1 is a plan view of the board end matching and sawing machine;

Fig. 2 is a front elevation of the same;

Fig. 3 is a fragmentary detail view with some parts sectioned on the line 3—3 of Fig. 1;

Fig. 4 is a view partly in elevation and partly in section taken on the line 4—4 of Fig. 1, on an enlarged scale;

Fig. 5 is a view corresponding to Fig. 4 but showing a different adjustment of the machine;

Figs. 6 and 7 are fragmentary detail views partly in elevation and partly in section taken on the lines 6—6 and 7—7 of Figs. 2 and 1, respectively, on an enlarged scale;

Fig. 8 is a fragmentary detail view with some parts sectioned on the line 8—8 of Fig. 1, on an enlarged scale;

Fig. 9 is a view corresponding to Fig. 8 but showing a different adjustment of the machine;

Fig. 10 is a plan view of the sawing unit of the machine, on an enlarged scale;

Fig. 11 is a view corresponding to Fig. 10, but showing a different adjustment of the machine, on an enlarged scale;

Fig. 12 is a view principally in section taken on the line 12—12 of Fig. 10;

Fig. 13 is a view principally in section taken on the line 13—13 of Fig. 11;

Fig. 14 is a view principally in section taken on the irregular line 14—14 of Fig. 10;

Fig. 15 is a view principally in section taken on the irregular line 15—15 of Fig. 11;

Fig. 16 is a perspective view of the cam mechanism of the sawing unit;

Fig. 17 is a view corresponding to Fig. 16 with some parts removed;

Fig. 18 is a fragmentary front elevation of the trip mechanism of the sawing unit, on an enlarged scale;

Fig. 19 is a fragmentary detail view in section taken on the line 19—19 of Fig. 18;

Fig. 20 is a view corresponding to Fig. 18 but showing a different adjustment of the machine;

Fig. 21 is a perspective view of one of the finished pieces of composite lumber as received from the machine; and

Fig. 22 is a fragmentary detail view in section taken on the line 22—22 of Fig. 21, on an enlarged scale.

The numeral 23 indicates a long, narrow base, in the form of an inverted channel bar, supported by legs 24 at a convenient height.

At the receiving end of the machine is a work feeding unit and forward thereof is a work sawing unit.

The work feeding unit includes a lower pair of idle feed rolls 25 and an upper pair of cooperating driven feed rolls 26, the former of which are journaled in bearings on a heavy casting 27 rigidly secured to the base 23 and projects rearward thereof, see Figs. 1, 2 and 3.

The upper feed rolls 26 are mounted in a pair of hoods 28 and their shafts 29 are journaled in the front sides of the hoods 28 and in long sleeve-like bearings 30 formed with the rear sides of said hoods. Formed with the hoods 28 and their bearings 30 are front and rear pairs of hinged lugs 31 connected by a fixed shaft 32 mounted, intermediate of its ends, in a bearing 33 on the casting 27.

The hinged hoods 28 and bearings 30 support the upper feed rolls 26 for radial movements in respect to the idle feed rolls 25. These upper feed rolls 26 are yieldingly and independently pressed toward the idle feed

rolls 25 by coiled springs 34 that encircle eyebolts 35 pivoted to lugs on the front of the hoods 28, intermediate of their ends, loosely work through apertures in an overlying bracket 36 rigidly secured to the bearing 33, at the top thereof, and having nuts 37 which normally engage the bracket 36 and limit the movements of the upper feed rolls 26 toward the lower feed rolls 25.

The upper feed rolls 26 are simultaneously driven in the direction of the arrows indicated in Fig. 8 from an electric motor 38 the base of which is rigidly secured to a motor support 39 in the form of a rear extension on the casting 27. The driving connections from the motor 38 includes a friction clutch 40 that is normally released. This clutch 40 is mounted on a shaft 41 journaled in bearings 42 on a support 43 rigidly secured to the casting 27 and forms a rear extension thereof.

The driving member of the clutch 40 is loose on the shaft 41 and has a relatively large pulley 44 aligned with a relatively small pulley 45 on the shaft of the motor 39 and over which pulleys a belt 46 runs. The driven member of the clutch 40 is keyed to the shaft 41 with freedom for axial sliding movement into and out of engagement with the driving member of said clutch. Axial movement of the driving member of the clutch 40, away from the driven member thereof is prevented, when the clutch is set, by the engagement of the hub of the pulley 44 with the rear bearing 42.

On the outer face of the driven member of the clutch 40 is a shipper collar 47 having an upright shipper lever 48 pivoted at its lower end to the support 43 and operated by a horizontal shift bar 49. One end of the shift bar 49 is pivoted to the upper end of the shipper lever 48 and its other end portion is slidably mounted in a long bearing 50 on the casting 27.

The driven member of the clutch 40 is normally and yieldingly held released by a coiled spring 51 mounted in a pocket 52 in the bearing 50. This spring 51 is compressed between the bottom of the pocket 52 and a washer and a nut 53 on one end of a rod 54 which extends parallel to the shift bar 49, axially through said spring, a hole in the bottom of the pocket 52 and a U-shaped anchor strap 55 on said shift bar. The end of the rod 54 which extends through the strap 55 is screw-threaded and has a nut 56 applied thereto that connects the rod 54 to the bar 49 against the action of the spring 51.

The clutch 40 is automatically set and held set by the work as the same is being moved to the feed rolls 25 and 26 and released when the continuous feeding of the work to said feed rolls is interrupted as will hereinafter appear.

The driving connections from the shaft 41 to the upper feed rolls 26 includes a spur pinion 57 keyed to said shaft and meshes with a large spur gear 58 loosely journaled on the rear end of the shaft 32. On the front face of the gear 58 is a spur pinion 59 which meshes with two spur gears 60 keyed, one to the rear end of each shaft 28. As the pinion 59 is at the center about which the two feed rolls 26 move bodily, hence, the gears 60 move concentric about the pinion 59 and are always in mesh therewith during the raising and lowering of said rolls.

It may be here stated that the work is a continuous piece of composite lumber made up of a multiplicity of short pieces of boards A of different lengths that are endwise matched, glued together and sawed into pieces of lumber B of a given length one of which is shown in Fig. 21.

Prior to the feeding of the boards A to the machine one end of each thereof is cut to form therein two laterally spaced tongues C and the other end thereof is cut to form therein two laterally spaced grooves D. These tongues C and grooves D have a tapered fit and are formed in any well known manner, see Fig. 22.

The pieces of boards A are assembled and fed to the feed rolls 25 and 26 on a long narrow work table 61 rigidly secured to the face of the casting 27. This work table 61 extends considerably forward of the feed rolls 25 and 26 and rearward thereof and has aperture 62 in which the lower feed rolls 25 work with their uppermost surfaces slightly above the top of said table to hold the work for free movement thereover, see Figs. 8 and 9. Rigidly secured to the top of the table 61 is a long guide rail 63 against which the pieces of boards A are positioned to longitudinally align the same as they are successively connected.

The first board A placed on the feed table 61 is fed to the feed rolls 25 and 26 by hand with its tongue-equipped end toward said feed rolls. The other boards A are successively placed on the feed table 61, in the same order as the first board A, with their inner longitudinal edges against the guide rail 63. Prior to placing the boards A on the feed table 61 their tongues C are dipped in glue to form a glue joint E between the connected ends of said boards. At the time a board A is manually placed on the feed table 61 it is given an endwise movement toward the feed rolls 25 and 26 and guided by the rail 63 to force its tongues C into the grooves D of the previously positioned board A, which is between the feed rolls 25 and 26, to connect said boards. This movement of the tongues C into the grooves D spreads the glue evenly therebetween and against the abutting ends of said boards.

Referring now to the automatic means for operating the shift bar 49, against the tension of the spring 51, for setting the clutch 40 to operate the feed rolls 26 and permit said clutch to release under the action of the

spring 51 to stop the driving connections for said rolls, this automatic means includes a cam roller 64 that works in a spiral cam channel 65 in a segmental cam block 66 rigidly secured to the rear end of a rock-shaft 67 which extends horizontally and parallel to the axis of the feed rolls 25 and 26. The rock-shaft 67 is journaled, intermediate of its ends, in a bearing 68 on the casting 27 and a pair of collars 69 on said shaft holds the same against endwise movement in the bearing 68.

Rigidly secured to the front end of the shaft 67, which overlies the feed table 61 and is spaced thereabove, is a wide flat arm 70 which projects downward toward the feed rolls 25 and 26. Normally the spring 51 holds the shift bar 49 retracted and in which position it holds the clutch 40 released and the cam roller 64 thereon acting on the cam block 66 holds the rock-shaft 67 in a position in which the arm 70 extends downward with its free end extending into an aperture 71 in the feed table 61, see Figs. 8 and 9. Stop lugs 72, on the sides of the cam block 66 at the ends of the cam channel 65, are arranged to engage the shift bar 49, as an abutment, to limit the extreme oscillatory movements of the arm 70.

The first board A placed on the feed table 61 and fed by hand to the feed rolls 25 and 26 engages the arm 70, swings the same upward toward said rolls to permit the board A to pass thereunder and causes the arm 70 to ride on said board under the tension of the spring 51, see Figs. 4 and 8. This movement of the arm 70, by the board A, sets the clutch 40 to operate the feed rolls 26, through the connections just described and feed the composite lumber toward the rear of the machine. As long as boards A are successively connected to the forwardly traveling piece of composite lumber the arm 70 will ride thereon and hold the clutch 40 set.

In case the manufacture of composite lumber B is interrupted by not connecting a board A to the rear end of the lumber B said lumber will pass from under the arm 70 and release the same. At the time the arm 70 is thus released the tensioned spring 51, acting on the shift bar 49, will, through the connections operated thereby, swing the arm 70 downward in the path of movement of the composite lumber B on the feed table 61 and also release the clutch 40 to stop the feed rolls 26, and hence, the feeding movement of the composite lumber B before its rear end reaches the first set of feed rolls 25 and 26.

The object of automatically releasing the clutch 40, to stop the feeding of the composite lumber B before its rear end reaches the first pair of feed rolls 25 and 26, is to prevent said rolls from crushing the rear end of said lumber at the grooves D and also position said rear end of the composite lumber B where a board A may be connected thereto before reaching said feed rolls when the manufacture of composite lumber is resumed.

To instantly stop the feeding of the composite lumber B, at the time the clutch 40 is released, under the momentum thereof and that of the feed rolls 25 and 26, there is provided a retarding device which acts directly on said lumber after the same has passed from between said feed rolls. This retarding device, as shown, includes a yielding friction shoe 73 which directly rests on the composite lumber B and presses the same onto the feed table 61.

The shoe 73 has four upstanding screw-studs 74, at its corners, which loosely extend through holes in an overlying bracket 75 rigidly secured to the casting 27, see Fig. 7. Pairs of nuts 76 applied to the upper ends of the screw-studs 74 overlie the bracket 75 for engagement therewith to limit the movement of said shoe toward the feed table 61. Interposed between the shoe 73 and the bracket 75 is a pressure plate 77 having holes through which the screw-studs 74 loosely extend. Also interposed between the shoe 73 and pressure plate 77 are four yielding members 78 of rubber or any other suitable material. These members 78 are positioned at the corners of the shoe 73 and have holes through which the screw-studs 74 project and hold said members in position. The members 78 are held under a variable compression with the nuts 76 engaging the bracket 75, as a base of resistance for the shoe 73, by a long set-screw 79 that has screw-threaded engagement with the bracket 75 and impinges against the pressure plate 77 at the center thereof. The normal position of the shoe 73 above the feed table 61 is slightly less than the thickness of the composite lumber B so that said shoe will be slightly raised, and hence, the nuts 76 from the bracket 75 by the feeding of the composite lumber B thereunder to compress the members 78 and cause the same to engage the composite lumber B with the desired tension.

Referring now in detail to the sawing unit, which includes a circular saw 80 that is mounted on the shaft of an electric motor 81 and which shaft extends parallel to the feed table 61 and is spaced directly thereabove. The motor 81 is rigidly secured to and forms an extension of the front arm of a horizontal lever 82 that extends transversely of said motor. This lever 82 is pivoted, intermediate of its ends, to a pair of bearings 83 on a carriage 84 and which lever, at its pivot and connection with the motor 81, is very wide and securely holds the saw 80 against angular movements in the plane thereof.

Normally the saw 80 is yieldingly held raised by a long coiled spring 85, see Fig. 14, and by reference to Fig. 11, it will be noted that the saw 81 is just beyond the rear end of the feed table 61 so as to clear said table

when the saw 81 is moved downward for sawing action, as shown in Fig. 15. The spring 85 encircles a long upright stem 86 the lower end of which is rigidly secured to the carriage 84, extends loosely through an aperture in the rear arm of the lever 82 and is compressed between a spring seat 87 and a spring cap 88. The stem 86 extends loosely through axial holes in the spring seat 87 and spring cap 88 and which spring seat 87 loosely rests on the lever 82 and the spring cap 88 engages a nut 89 on the upper end of said stem which affords an abutment for the spring 85 that is adjustable to vary the tension of said spring.

Normally the spring 85 holds the lever 82 in a position in which the saw 80 is raised and its rear arm rests on a yielding buffer 90. This buffer 90, as shown, is in the form of a block of rubber held between a pair of washers and which block and washers have axial holes through which the stem 86 extends. A pair of nuts having screw-threaded engagement with the stem 86 affords an adjustable support 91 for the buffer 90.

The carriage 84, as shown, is in the form of an inverted channel bar which extends longitudinally rearward of the feed table 61 with its upper face in the plane of the top of said table. Said carriage 84 is mounted for reciprocatory movement on a pair of rails 92 rigidly secured at their ends to supports mounted on and rigidly secured to the base 23. Secured to and depending from the under side of the carriage 84, at each end thereof, is a pair of yoke-like bearings 93, and in each of which is journaled upper and lower rollers 94. The rails 92 extend between the arms of the bearings 93 and upper and lower rollers 94, see Figs. 14 and 15, and which arms and rollers, by their contact with the rails 92, hold the carriage 84 against movement in all directions except straight line travel on the rails 92.

The carriage 84 is yieldingly held in normal position, in which it is closely positioned to the rear end of the feed table 61, to return to normal position by a long coiled spring 95 and a cooperating horizontal rod 96 which said spring encircles. Said rod 96 is below the base 23 and its rear end is connected, by a horizontal pivot, to the lower end of a depending arm 97 rigidly secured to the carriage 84 and projects through a longitudinal slot in the base 23, see Figs. 14 and 15. The rod 96 loosely extends through a fixed angle support 98, on the under side of the base 23, and the spring 95 is held compressed between said support and a washer-equipped nut 99 on the front end of said rod. On the top of the carriage 84 is a guide rail 100 longitudinally aligned with the guide rail 63.

To operate the lever 82, against the action of the spring 85 and feed the saw 80 to its work, a cam roller 101 is journaled on the rear end of said lever for cooperation with a cam 102. This cam 102, which is relatively fixed, is rigidly secured to a horizontal slide 103 that loosely rests on a raised bed 104 rigidly secured to a bracket 105 which, in turn, is rigidly secured to the base 23 at the back thereof.

The slide 103 has a compound movement on the bed 104, that is parallel to and transversely of the direction of travel of the carriage 84, by a pair of depending shouldered cam studs 106 on the under side of said slide and which studs extend into cam slots 107 in the bed 104. Nuts and washers 108 applied to the lower ends of the cam studs 106 engage the underside of the bed 104 and hold the slide 103 against lifting movement therefrom. The purpose of the slide 103 is to position the cam 102 in the path of movement of the cam roller 101 during the travel of the carriage 84 away from the feed table 61 and to move the same laterally out of said path during the return movement of the carriage 84.

A coiled spring 109 and cooperating horizontal rod 110, which said spring encircles, yieldingly and normally holds the slide 103 with its cam 102 in the path of movement of the cam roller 101. One end of the rod 110 is pivotally connected to the lower end of one of the cam studs 106, extends parallel to the direction of travel of the carriage 84 and through a hole in the rear end of the bed 104. On the outer end of the rod 110 is a nut and washer 111 and the spring 109 is compressed between said nut and washer and the adjacent end of the bed 104.

The rear end of the cam 102 is perpendicular to the slide 103 and affords an abutment 112 for the cam roller 101. Said cam roller 101, during the travel of the carriage 84 in the direction of the movement of the composite lumber B in the machine, rides upward on the cam 102 and operates the lever 82 to feed the saw 80 to said lumber and cut the same in predetermined lengths. At the completion of this cutting action of the saw 80 the cam roller 101 passes over the cam 102 and drops, under the action of the compressed spring 85 on the lever 82, back of the abutment 112. This movement of the lever 82 returns the saw 80 to normal position. The cam roller 101, during the initial return movement of the carriage 84, under the action of the spring 95 which was placed under tension by said carriage during its travel toward the rear end of the machine, engages the abutment 112 and moves the slide 103 with the carriage 84. During this movement of the slide 103 with the carriage 84 the cam slots 107 acting on the cam studs 106 move the slide 103 laterally away from the carriage 84 and the cam 102 out of the path of movement of the cam roller 101 and permit said

roller to pass the cam 102. After the cam roller 101 has passed the cam 102 the spring 109 returns the slide 103 and its cam 102 to normal positions.

During sawing action the carriage 84 is moved with the composite lumber B as the same is moved toward the rear of the machine by the feed rolls 25 and 26. To cause the carriage 84 to move with the composite lumber B and at the same rate of speed as its lineal travel, there is provided a connector for securing the carriage 84 to the lumber B to be moved thereby. This connector is in the form of a friction clamp that is automatically applied to the lumber B and released therefrom. This friction clamp includes a friction block 113 carried by a head 114 which is adjustably and detachably applied to the outer or front arm of a lever 115 and pivoted intermediate of its ends to a fixed bearing 116 on the carriage 84, see Figs. 12 and 13.

The head 114 includes an upper section and a lower section connected by a horizontal pivot which permits said lower section to swing transversely of the carriage 84. Said upper section of the head 114 has a seat through which the respective arm of the lever 115 extends. A set-screw 117 in the upper section of the head 114 impinges against the lever 115 and adjustably and detachably secures the head 114 thereto. The block 113 is secured by screws 118, at its four corners, to the lower section of the head 114. Elastic members 119 of rubber or other suitable material are interposed between the block 113 and the head 114 and held in place by the screws 118 which extend through holes therein. These members 119 permit a slight yielding action of the block 113 in respect to the head 114 when applied to the lumber B.

The clamp is yieldingly held raised by a coiled spring 120 which encircles a long bolt 121 the lower end of which is screwed into the bearing 116 and loosely extends through a large hole in the rear or inner arm of the lever 115. The lever 115 extends parallel to the lever 82 and has a cam roller 122 journaled on the rear arm of said lever.

Cooperating with the cam roller 122 is a relatively fixed cam plate 123 on a slide 124 mounted on a bed 125 in a plane parallel to the bed 104. The bed 125 is rigidly secured to the bracket 105 and supports the slide 124 in a plane below the slide 103. A pair of depending cam studs 126 on the slide 124 extend into cam slots 127 in the bed 125 which are parallel to the cam slots 107 and impart a compound movement to the slide 124 that is like the compound movement imparted to the slide 103 in respect to the carriage 84. Nuts 128 applied to the lower ends of the cam studs 126 engage the bed 125 and hold the slide 124 against lifting movement therefrom.

The slides 103 and 124 are loosely connected at their adjacent ends by overlapping flanges 129 and 130, respectively, and this connection is made adjustable by a set-screw 131 having threaded engagement with the flange 129 and impinges against the flange 130, see Fig. 16. By this connection the slide 103 holds the slide 124 in normal position and returns the same to normal position under the action of the spring 109 as will presently appear. An adjustable stop, in the form of a set-screw 132, having threaded engagement with an upstanding lug 133 on the rear end of the bed 125, is arranged to be engaged by the slide 124 and set the same in normal position. This stop 132 acting through the flanges 129 and 130 and the stop 131 also positions the slide 103 in normal position.

The loose connection between the slides 103 and 124 permit independent movements of said slides transversely of the direction of travel of the carriage 84. When the slides 103 and 124 are in normal positions the cam 102 in the path of movement of the cam roller 101 and the cam 123 in the path of movement of the cam roller 122.

Overlying the cam 123 and spaced thereabove is a cam block 134 formed with and projecting radially from a rock-shaft 135 carried by bearings on the slide 124 and which shaft extends parallel to the direction of travel of the carriage 84. On the front end of the cam block 134 is a cam 136 and the rear end thereof affords an abutment 137.

The shaft 135 is yieldingly held with the cam block 134 in normal position by a fixed post 138 on the slide 124 and a coiled spring 139 which encircles an eye-bolt 140 pivoted to said post for vertical swinging movement. This shaft 135 is provided with a radial arm 141 the upper end portion of which is axially offset in respect to said shaft and provided with an eye through which the bolt 140 loosely projects. The spring 139 is compressed between the arm 141 and a nut 142 on the outer end of the bolt 140 and yieldingly and normally holds the arm 141 pressed against the post 138, see Figs. 10 to 13, inclusive.

During the initial movement of the carriage 84, toward the rear of the machine, the cam roller 122 engages the oblique front end of the cam plate 123, rides upward thereon and clamps the block 113 onto the underlying piece of composite lumber B, presses the same onto the carriage 84 and couples said carriage thereto so that the saw 80 travels with the lumber B. At the time the cam roller 122 moves onto the cam plate 123 it engages the cam 136 and rocks the cam block 134 out of its path of movement against the tension of the spring 139. The cam block 113 is held inoperative by the cam roller 122 until said roller passes out of engagement with the cam plate 123, and at which time the spring

120 lifts the block 113 from the lumber B and stops the carriage 84. When the cam roller 122 passes rearward of the cam plate 123 it also passes out of engagement with the cam block 134 which is instantly returned by the spring 139 to normal position in which it is in the path of movement of the cam roller 122 during the return movement of the carriage 84.

During the initial movement of the carriage 84, by the lumber B to which it is connected by the clamp just described, the cam roller 101 engages the cam 102 and starts the feeding movement of the saw 80 to the lumber B. By the time the cam roller 101 passes out of engagement with the cam 102 the saw 80 has sawed the lumber B in two and drops in front of the abutment 112 which lifts said saw and returns the same to normal position.

While the carriage 84 is being moved by the lumber B, the spring 95 is being placed under tension thereby and when the friction clamp is released, by the movement of the cam roller 122 from the cam plate 123, said spring returns the carriage to normal position. During the initial return movement of the carriage 84 the cam roller 101 engages the abutment 112 and moves the slide 103 therewith and at which time the cam slots 107 acting on the cam studs 106 moves said slide laterally away from the carriage 84 and the cam 102 is carried thereby out of the path of movement of said cam roller which passes the same.

At the time the cam roller 101 is moving the slide 103 with the return of the carriage 84 the cam roller 122 engages the abutment 137 and imparts a movement to the slide 124 like that of the slide 103 and produced by the cam slots 127 acting on the cam studs 126. This movement of the slide 124 carries the cam plate 123 and cam block 134 out of engagement with the cam roller 122 and permits said cam roller to pass the same. During the passing of the cam block 134 by the cam roller 122, said roller acts as an abutment for the cam block 134 and holds the slide 124 against the action of the spring 109 which is transmitted through the slide 103 and connection 129, 130 and 131 to the slide 124. After the cam roller 101 has passed out of engagement with the cam 102 and the cam roller 122 out of engagement with the cam block 134 the spring 109 returns the slides 103 and 124 to nomal positions.

Referring now to mechanism for imparting the initial movement to the carriage 84 which carries the cam roller 122 onto the cam slide 123 to operate the friction clamp and connect the carriage 84 to the lumber B for movement therewith under the action of the feed rolls 25 and 26. The mechanism is in the nature of a trip which includes a horizontal pull bar 143 for the carriage 84, set vertically edgewise longitudinally of and in front of said carriage and is connected thereto by a cross-head 144 on its rear end which works in a vertical way 145 on the front end portion of the carriage 84. Said pull bar 143 is supported for compound endwise and vertical movements on a pair of horizontal cam studs 146 which project through a pair of horizontal longitudinally spaced cam slots 147 in said bar. The cam studs 146 are rigidly secured to a work support 148, at the front face thereof, and are equipped with nuts 149 and cooperating washers which hold the pull bar 143 on the cam studs 146 and against said front face of the work support 148. Said work support 148 is rigidly secured to the top of the base 23, projects forward thereof and its upper face is in the plane of the upper surface of the carriage 84 so that the lumber B as the same is moved endwise over said carriage passes over and onto said work support.

An abutment 149 associated with the pull bar 143 is normally in the path of movement of the lumber B and is arranged to be engaged and moved thereby to impart the initial movement to the carriage 84. This abutment 149 is in the form of a block on the upper or short end of an upright lever 150 pivoted intermediate of its ends to a bearing 151 rigidly secured to the pull bar 143 for swinging movement longitudinally thereof. The lever 150 holds the abutment 149 above the pull bar 143 in the path of movement of the lumber B on the work support 148.

It may be here stated that the pull bar 143, by its engagement with the cam studs 146 at the rear ends of the cam slots 147, affords a stop which limits the return movement of the carriage 84 under the action of the spring 95. This stop always positions the saw 80 a predetermined distance from the abutment 149 which determines the length of the pieces to be cut from the lumber B by the saw. During the final return movement of the carriage 84 the lower or long arm of the lever 150 engages an abutment 152, which projects outward of the rear end of the work support 148 to which it is rigidly secured, and tilts the lever 150 toward the front end of the machine to position the face of the abutment 149 toward the end of the lumber B so that it inclines downward and away from said end of the lumber B. The purpose of thus positioning the abutment 149 is to insure a better holding contact with the lumber B when struck thereby and prevent said lumber from riding thereover. Furthermore, at the time of the impact delivered by the rear end of the lumber B to the abutment 149 the lever 150 will move on its pivot, as well as bodily, with the pull bar 143 to cushion the blow and prevent separation of the abutment 149 and lumber B so that the pieces of lumber cut by the

saw 80 are always exactly the same length. The pivotal movement imparted to the lever 150 also changes the position of the abutment 149 so that the inclination of its operative face is just the reverse from that, as shown in Fig. 18, see Fig. 20, so that said abutment freely releases from the engaged end of the lumber B as the pull bar 143 is caused to move downward by the cam slots 147.

The formation of the cam slots 147 is such that the first movement imparted to the pull bar 143, by the engagement of the moving lumber B with the abutment 149 is straight and the carriage 84 will be drawn by said bar a sufficient distance to operate the friction clamp, as heretofore described, to connect the carriage 84 to the moving lumber B. Further movement of the carriage 84 will be imparted thereto by the moving lumber B and during the first part thereof the oblique portions of the cam slots 147 will engage the cam studs 146 and move the pull bar 143 downward and release the abutment 149 from the engaged end of the lumber B. The remainder of the movement of the pull bar 143 will be straight and at which time the saw 80 has been fed to the work and cut the same, as shown in Fig. 20.

What I claim is:

1. In a machine of the class described, a work feed device, and means for operating the feed device including a trip arranged to be held in position by the work during its movement to the feed device and be released thereby to stop the feed device, and a retarding device for the work as the same is acted on by the feed device.

2. In a machine of the class described, a work feed device, and means for operating the feed device including a trip arranged to be held in position by the work during its movement to the feed device and be released thereby to stop the feed device before the rear end portion of the work is acted on by the feed device.

3. In a machine of the class described, a work feed device, a work table on which matched pieces of boards are successively connected as they are moved toward the feed device, and means for operating the feed device including a trip arranged to be held in position by the connected pieces of boards and on the work table and be released thereby, in case a piece of board is not connected to the last piece of board passing the trip.

4. In a machine of the class described, a work feed device, a work table on which matched pieces of boards are successively connected as they are moved toward the feed device, and means for operating the feed device including a trip arranged to be held in position by the connected pieces of boards and on the work table and be released thereby, in case a piece of board is not connected to the last piece of board passing the trip to stop the feed device before the matched end of said last piece of board is engaged by the feed device.

5. In a machine of the class described, a pair of cooperating feed rolls, means for driving one of the feed rolls including a clutch under strain to release, and means for setting the clutch including a cam having a lever arranged to be actuated by a piece of work as the same is moved to the feed device and ride thereon until released by the work passing from thereunder.

6. In a machine of the class described, a lower pair of radially spaced idle feed rolls, a pair of driven upper feed rolls cooperating with the idle rolls, said driven rolls being journaled in bearings mounted to swing about a common axis and spring-pressed toward the idle rolls, a gear on each of the driven rolls, a gear meshing with the gears on the driven rolls and mounted to turn about said common axis, means for driving the last noted gear including a clutch under strain to release, a work table on which work is moved to the feed rolls, and means for setting the clutch including a trip arranged to be held by a piece of work on the table as the same is moved to the feed rolls and be released by the work as the same passes thereunder.

7. In a machine of the class described, a work feed device, a reciprocatory carriage, a cutter on the carriage, means operated by a piece of work as the same is moved by the feed device for imparting the initial movement to the carriage, means actuated by the carriage during its initial movement for causing said carriage to move with the work for a predetermined distance and then release the same, and means actuated by the last noted movement of the carriage for causing the cutter to act upon the work during its movement by the work.

8. The structure defined in claim 7 which further includes means for returning the carriage to normal position.

9. In a machine of the class described, a work feed device, a reciprocatory carriage, a cutter on the carriage, means operated by the movement of the work by the feed device for imparting the initial movement to the carriage, means actuated by the initial movement of the carriage to cause the carriage to move a predetermined distance with the work and then release the same, means for operating the cutter during the last noted movement of the carriage, and a spring arranged to be placed under tension by the movement of the carriage by the work and for returning the carriage to normal position when released in respect to the work.

10. In a machine of the class described, a work feed device, a reciprocatory carriage over which the work is moved by the feed de-

vice, a cutter on the carriage, means operated by the movement of the work by the feed device for imparting the initial movement to the carriage, a normally released clamp, means operated by the initial movement of the carriage for pressing the clamp onto the work onto the carriage and cause said carriage to move with the work, means operated by the last noted movement of the carriage for releasing the clamp after a predetermined movement of the carriage, and means for operating the cutter during the last noted movement of the carriage.

11. In a machine of the class described, a work feed device, a reciprocatory carriage, a cutter on the carriage, a trip intermittently operated by the movement of the work by the feed device for imparting the initial movement to the carriage and then release the same, means operated by the initial movement of the carriage for causing the carriage to move a predetermined distance with the work and then release the same, and means for operating the cutter during the last noted movement of the carriage with the work.

12. In a machine of the class described, a work feed device, a reciprocatory carriage, a cutter on the carriage, a trip intermittently operated by the movement of the work by the feed device for imparting the initial movement to the carriage and then release the same, a normally released clamp on the carriage operable to engage the work and cause the carriage to move therewith, a cam arranged to operate the clamp during the initial movement of the carriage and then release the same after a predetermined movement of the carriage with the work, and means for operating the cutter during the last noted movement of the carriage with the work.

13. In a machine of the class described, a work feed device, a reciprocatory carriage, a cutter on the carriage, a pull bar movably mounted on the carriage and having an abutment arranged to be engaged by the work during its movement by the feed device to impart the initial movement to the carriage, a cam for operating the pull bar to release its abutment from the work after a predetermined initial movement of the carriage, means operated by the initial movement of the carriage for causing the carriage to move a predetermined distance with the work and then release the same, and means for operating the cutter during the last noted movement of the carriage by the work.

14. In a machine of the class described, a work feed device, a reciprocatory carriage, a cutter on the carriage, a trip intermittently operated by the movement of the work by the feed device for imparting the initial movement to the carriage and then release the same, a lever pivoted intermediate of its ends to the carriage and having on one end a clamping head, arranged to be pressed onto the work for causing the carriage to move with the work, and on its other end a cam roller, a cam arranged to be engaged by the cam roller during the initial movement of the carriage and operate the lever to press the clamping head onto the work and then release the same, and means for operating the cutter during the last noted movement of the carriage.

15. In a machine of the class described, a work feed device, a reciprocatory carriage, a motor driven cutter mounted on the carriage for movement to and from a cutting position, means for causing the carriage to intermittently move with the work, and a cam for moving the cutter into an operative position during the movement of the carriage with the work and then release the same.

16. In a machine of the class described, a work feed device, a reciprocatory carriage, a lever pivoted intermediate of its ends on the carriage, a motor-driven saw mounted on one end of the lever, a cam roller on the other end of the lever, yielding means under strain to hold the lever with the saw in an inoperative position, means for intermittently moving the carriage with the work, and a cam arranged to be engaged by the cam roller during the movement of the carriage with the work and operate the lever to move the saw into an operative position for action on the work and then release the same.

17. In a machine of the class described, a work feed device, means for operating the feed device including a trip arranged to be held in position by the work during movement to the feed device and be released thereby to stop the feed device, and a variable tension-retarding device for the work as the same is acted on by the feed device.

In testimony whereof I affix my signature.

JOHN E. KALGREN.