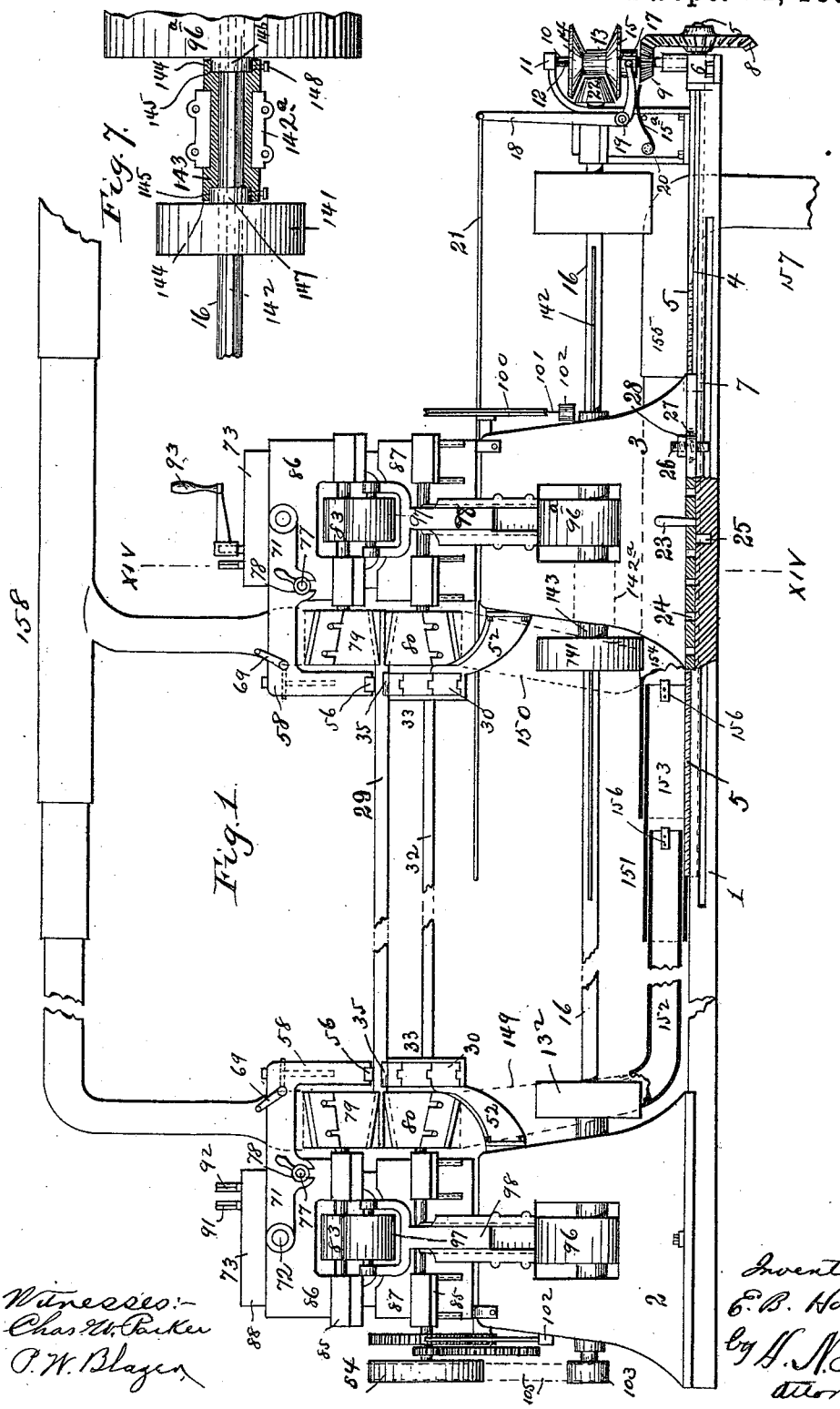
(No Model.) 4 Sheets—Sheet 1.

E. B. HAYES.

TENONING MACHINE.

No. 525,812. Patented Sept. 11, 1894.



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(No Model.) 4 Sheets—Sheet 2.

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TENONING MACHINE.

No. 525,812. Patented Sept. 11, 1894.

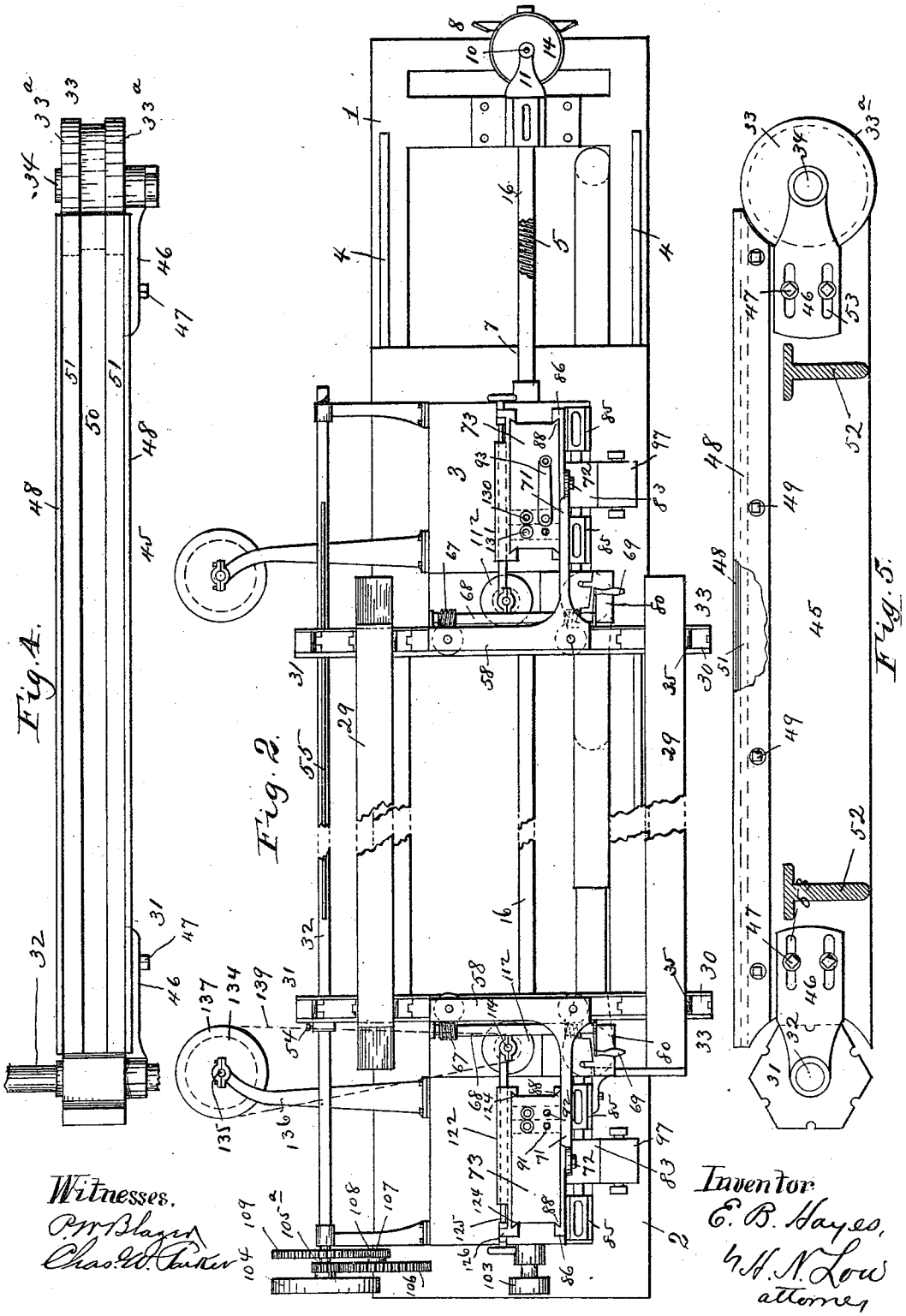

Fig. 4.

Fig. 2.

Fig. 5.

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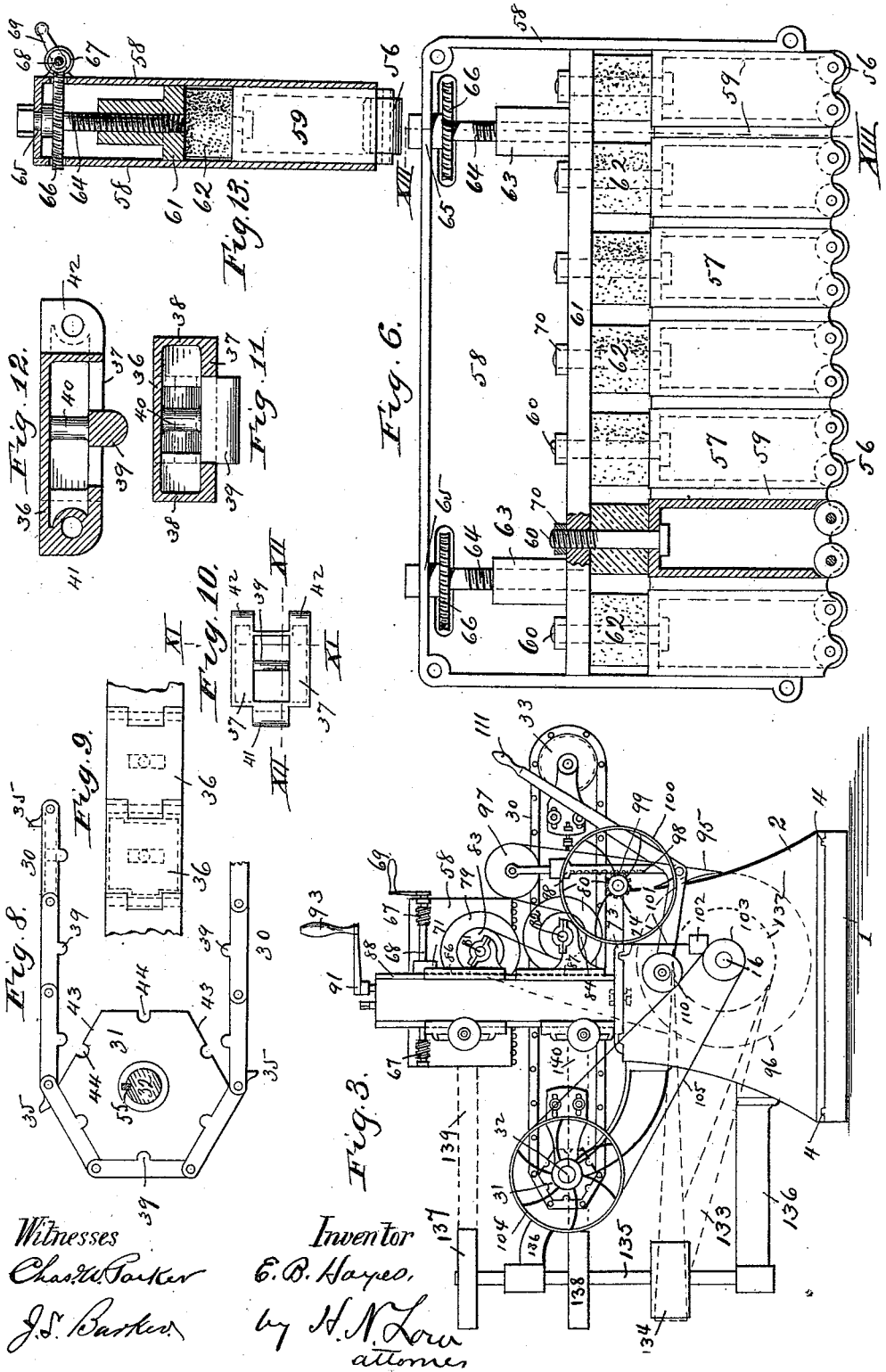

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(No Model.) 4 Sheets—Sheet 4.

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TENONING MACHINE.

No. 525,812. Patented Sept. 11, 1894.

Fig. 15.

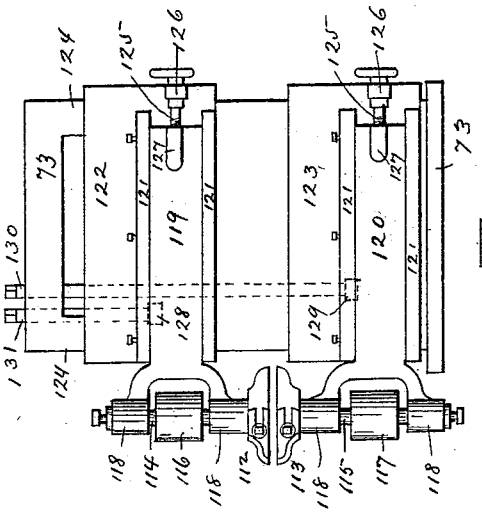


Fig. 16.

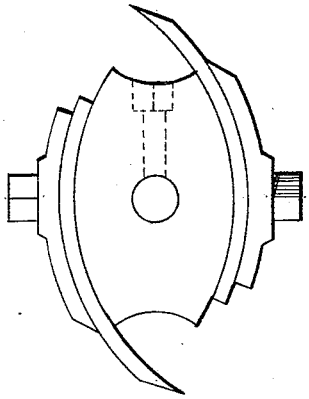
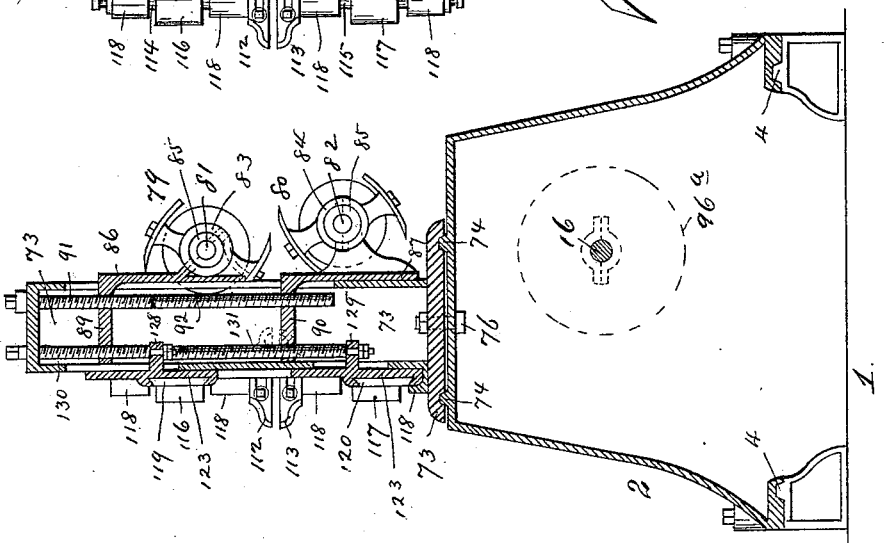


Fig. 14.



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UNITED STATES PATENT OFFICE.

ELI B. HAYES, OF OSHKOSH, WISCONSIN.

TENONING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 525,812, dated September 11, 1894.

Application filed December 5, 1892. Serial No. 454,141. (No model.)

To all whom it may concern:

Be it known that I, ELI B. HAYES, a citizen of the United States, residing at Oshkosh, in the county of Winnebago, State of Wisconsin, have invented certain new and useful Improvements in Tenoning-Machines; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

It is the object of my invention herein described to provide an improved means for tenoning the end or ends of the rails and muntins of doors, or of rails or frame pieces of sashes, blinds, furniture or other articles; also to provide improved devices whereby door rails, or other frame pieces, may be coped at the base of the tenon.

My improvements are especially directed to the construction of the main frame of the tenoning machine so as to permit of the ready collection and piping away of the shavings, the room necessary for this purpose being obtained, and the machine at the same time adapted to be adjusted for different lengths of stock or lumber, by combining with a base plate two pedestals one of which is movable on the plate and on which the rails or other work are held, moved and operated upon at a considerable height above the plate.

My improvements are further directed to the means by which the feed devices and cutters are actuated so as to permit of the aforesaid adjustment of the machine for different lengths of lumber, and by which the user of the machine may almost instantly make the required change without stopping it and with the minimum suspension of the actual cutting operation.

My improvements further relate to the means by which the rail or other work is held, and fed toward the cutters.

Having such principal objects in view my improvements consist in the parts and combinations thereof hereinafter set forth and claimed; and in order to make the invention more clearly understood I have shown in the accompanying drawings forming a part of this specification means for carrying it into practical effect, without limiting the invention in its useful applications to the particular construction which, for the sake of illustration, I have delineated.

In said drawings—Figure 1 is a front elevation of a tenoning and coping machine embodying my improvements. Fig. 2 is a plan view of the same certain parts being removed. It will be understood that in the foregoing views the full length of the machine is not shown, the middle portion being broken away. Fig. 3 is an end view of the machine, certain parts shown in Fig. 1 being omitted looking from the left of Figs. 1 and 2. Figs. 4 and 5 are respectively a plan and side view, on a larger scale, of the feed-chain sprockets and chain supporting devices. Fig. 6 is an elevation partly in section of the pressure device for holding down the work, the same being shown on a larger scale. Fig. 7 is a sectional view illustrating the mode of mounting and driving the cutter actuating pulleys. Figs. 8, 9, and 10, illustrate by side, top and bottom views the construction of the links of the feed chains. Figs. 11 and 12 are sectional views on lines XI—XI, and XII—XII, Fig. 10, shown on a larger scale. Fig. 13 is a sectional view on XIII, XIII, Fig. 6. Fig. 14 is a sectional view on line XIV—XIV, Fig. 1. Fig. 15 is a side elevation of the cope-cutters and their supports. Fig. 16 is a plan view of one of the cope-cutter heads.

Referring to the drawings, 1 indicates the base plate of the machine which is provided with a fixed pedestal 2 and a longitudinally adjustable pedestal 3 adapted to move in or on suitable guides formed in or attached to the base 1, such as ribs 4 fitting in grooves in the bottom of said adjustable pedestal.

5 is a longitudinal screw-shaft held in a bearing 6 on the base so as to be immovable lengthwise, and engaging a nut 7 cast with or attached to the pedestal 3. On said shaft is fixed a gear wheel 8 of bevel form, engaged by a bevel pinion 9 fixed on a vertical shaft 10. The latter is mounted in bearings 11 on or supported on the base, has a vertical spline or groove 12, and is provided with a sliding sleeve 13 engaging said spline or groove and rotary with the shaft 10 but free to be moved up and down thereon. This sleeve carries two bevel friction wheels 14, 15, in line with which is mounted a bevel friction pinion 22

on the end of the main longitudinal power shaft 16, which latter turns in suitable bearings on the pedestals 2, 3.

A loose collar 17, engaging the sleeve 13, is connected with one end of a lever 18 fulcrumed at 19 on a post 20 which also supports the outer end of the shaft 16. To this lever is attached a rod 21 which extends to a point near where the operator stands at the front of the machine, and by which the sleeve 13 and wheels 14, 15, supported in normal position by spring 15ª, may be moved to cause one or the other of said wheels to engage the pinion 22, rotate the screw 5, and move the pedestal 3 nearer to or farther from the pedestal 2. A shorter or longer rail may then be tenoned simultaneously at both ends. Doors, and consequently the transverse rails thereof, differ in size (the doors in width and the rails in length) varying regularly by two inches. Thus if one size of door be two feet two inches wide the next larger will be two feet four inches, and so on.

As I have especially designed this machine for tenoning door rails, and as by the ordinary means of manufacture much time is lost in changing the machine for different lengths of rails, or from want of care the proper adjustment is not made and inaccurate work produced, I have provided an improved form of stop by which, in connection with the adjusting mechanism above described, the machine may be accurately and rapidly set for the various standard lengths of door rails.

23 is a taper pin fitting any one of a series of perforations 24 in the pedestal 3 and having its lower end adapted to fit neatly in a recess or hole 25 in the plate 1. When it is desired to adjust the machine from one length to another the pin 23 is placed in the proper one of the perforations 24 with its lower end resting on the surface of the bed plate 1. The adjusting mechanism is then started by the rod 21 in the necessary direction, and, when said pin arrives at the hole 25 it drops by gravity thereinto and brings the pedestal to rest in accurate position. When the pedestal is thus abruptly stopped the wheels 14, 15 will also cease their rovolution and the friction pinion 22 will slip until the sleeve 13 is raised or lowered to its neutral position, which will be as soon as the operator notices that the pin has dropped into the hole 25.

26 is a clamping bolt engaging the bed 1 and passing up through an ear 27 in the pedestal. By a nut 28 on the upper end of this bolt the pedestal may be firmly clamped when adjusted.

I will now describe the means by which the rail or other piece of stock to be tenoned, and which lies in the machine in a position parallel with the length of the latter, and passes through horizontally from the front to the back of the machine (from the right to the left in Fig. 3), is held and fed to the cutters.

29 indicates a rail to be operated upon. It is supported upon the upper limbs of two endless feed chains 30, 30, one at each end of the rail, which chains pass over driving sprocket wheels 31 mounted on a longitudinal shaft 32 at the rear of the machine, and over guiding and supporting idler wheels 33 on stud shafts 34 at the front of the machine. Certain of the links of the feed chains, say every third link, have upwardly extending pins, stops or shoulders 35, preferably cast with such chain links, which engage the rear edge of the rail and carry it forward as the chains revolve. These chains I have specially improved to meet the requirements of a feed chain, and will here describe them in detail having especial reference to Figs. 8, 9, 10, 11, 12, of the drawings. The chains should be of proper width to give sufficient length of bearing to the connecting pivots of their links and cause the movement of the chains to be without lateral swaying and uniform. At the same time the chains require to be light, and yet of considerable strength. These various objects I have attained by the particular construction of chain link shown comprising a hollow partly open body carrying exteriorly the sprocket engaging tooth and the pivot ears, and having upon the top and bottom smooth faces for supporting the stock and for sliding upon a support or guide.

The link consists of a top plate 36, bottom bearing plates 37 having a space between them and situated contiguous to the sides of the link, and vertical plates 38 formed with and connecting said top and bottom plates. 39 is the sprocket tooth extending across said space between the bottom plates and joining the latter, and also joined with the top plate by a connection 40, which latter gives to the whole link great strength without impairing its lightness. At its ends the link is formed with suitable central and bifurcated pivot bearings 41 and 42 respectively.

The driving sprocket is polygonal in shape (Fig. 8) having flat faces 43 on which rest the plates 37 of the chain-links, and recesses 44 in which fit the teeth 39. The supporting or idler pulley 33 is circular in shape, having edge flanges 33ª on which rest the bearing plates 37 (Fig. 4). Between the sprocket and pulley of each chain is a beam 45 to which are secured bearing plates 46 for the shafts 32, 34. These plates are slotted as shown at 53 and adjustably connected with the beam by bolts 47 passing through the slots (Fig. 5), whereby the chain may be tightened and adjusted in position.

48 are steel ribs secured on the sides of the beam 45 by bolts 49 and projecting slightly above it to form a track or groove in which the upper limb of the chain runs. The top of the beam is centrally grooved at 50 leaving side ribs 51 on which run the plates 37 of the chain-links with the teeth 39 in the groove 50.

The beams 45, carrying the above described

feed mechanism, are mounted one upon each of the pedestals 2 and 3 by means of brackets 52. When the pedestal 3 is adjusted the left hand sprocket 31 (looking at Fig. 2) remains stationary, being secured to the shaft 32 by one or more set screws 54, and the right hand sprocket moves with the pedestal and slides along said shaft, being compelled to rotate therewith, however, at any point by a feather 55 with which the shaft is provided.

As the rail to be tenoned is carried across the machine by the chains 30 it is held firmly down in place by a series of presser rolls 56, a set of which is mounted above each chain. Said rolls are mounted in bearings on vertical sliding boxes 57 which fit in a casing 58 between guiding ribs or partitions 59. At their upper ends said boxes are connected by bolts 60 with a horizontal plate 61, rubber cushions 62 being interposed as seen in Fig. 6. The boxes with their presser rolls may thus yield upward individually.

The plate 61 has two screw-threaded bearings 63 engaged by screws 64 which have smooth bearings at 65 in the top of the casing 58. Said screws have worm wheels 66 projecting slightly through the casing and engaged by worms 67 on a band shaft 68. The latter may be turned at will by a crank 69, simultaneously adjusting all of the boxes and rolls 56 to any desired thickness of lumber. The boxes are individually adjusted on the plate 61 by turning the nuts 70 on the bolts 60.

I provide for throwing the whole presser device up out of the way when it is desired to sharpen or set the knives by connecting the casing 58 with an arm 71 and pivoting the latter at 72 to the cutter arbor frame 73. The latter is mounted on guides 74 on the pedestal and may be slid out longitudinally to bring the cutter heads into position to be removed. When in place the frame is securely clamped by a bolt 76 (Fig. 14). In its normal position the arm 71 rests on a bolt 77 and a clamp-nut 78 on the latter serves to fix the casing 58 in place.

The main cutter heads which form the tenon on the rail so held and actuated are shown, the upper at 79 and the lower at 80. Where my improvements are applied to a double machine, as illustrated, these heads are the same at each end of the machine and a description of one set is sufficient. The heads are of any usual or preferred character and are mounted on horizontal arbors 81, 82 provided with belt pulleys 83, 84.

The arbors rest in bearings 85 on slides 86, 87, fitting and vertically adjustable on guides 88 formed on the frame 73. Said slides are provided respectively with screw threaded lugs 89, 90 projecting inward through slots or openings into the hollow interior of said frame where they are engaged by vertical screws 91, 92 which have smooth bearings in the top of the frame 73 (Figs. 2 and 14). Said screws have squared heads and may be turned by any suitable key or crank 93 to adjust the top and bottom cutter heads to the desired height and distance apart according to the thickness of the lumber and of the tenon to be formed. The pulleys 83, 84 are driven by the belt 95 from a main belt pulley 96 or 96[a] on the shaft 16. This belt has a tightener pulley 97 operated in any well-known manner, as by a vertically movable rack 98, pinion 99, wheel 100, cord 101, and weight 102.

The feed chains already described are driven by a pulley 103 on the shaft 16, a loose pulley 104 on the shaft 32, a loose connecting belt 105, a gear pinion 105[a] fast to the pulley 104, a gear wheel 106 on a stud 107 and engaged by said pinion, a gear pinion 108 fast to the wheel 106, and a gear wheel 109 engaged by the pinion 108 and fast on the shaft 32 (see Fig. 2).

A tightener pulley 110 carried by a hand lever 111 and adapted to be pressed against the loose belt 105 serves to put the feed in operation when desired.

The coping cutter-heads are shown at 112 and 113, the former being the upper and the latter the bottom head. They are mounted on vertical arbors 114, 115 provided with drive pulleys 116, 117, and mounted in bearings 118 on horizontally and longitudinally movable carriages 119, 120. These carriages are held in guides 121 on slides 122, 123 and these in turn are fitted on vertical guides 124 on the rear of the frame 73. The copes are horizontally adjustable by screws 125 which fit in smooth bearings 126 on the slides 122, 123 and engage threaded bearings 127 on the carriages 119, 120 (Fig. 15). The slides 122, 123 have lugs 128, 129 which extend into the interior of the frame 73 and are there engaged by screws 130, 131, which also engage threaded bearings in the tenoning cutter slide lugs 89, 90. The above mentioned engagements of the screws 130, 131 with the lugs 128, 129 are smooth bearings, and when either screw is turned in these latter bearings the corresponding cope slide with its carriage and cope arbor and head is vertically adjusted on and relative to the corresponding (top or bottom) tenoning cutter head. A great deal of time is thus saved in performing the various necessary adjustments, the parts which it is necessary to manipulate are where they can be handled without danger or difficulty when the machine is running, and the relations of the parts and various cutting heads are more accurately preserved.

It is of especial advantage that the coping cutter carriages and slides have such a long bearing on the main frame. Heretofore in all machines of which I have any knowledge it has been necessary to stop the machine in order to adjust the coping heads, and, after loosening the heads it was a matter of much difficulty and care to set them again in proper

relation to the tenon cutter heads. But such difficulties are entirely overcome by my improvements.

132 is a belt pulley on the shaft 16 connected by a belt 133 with a pulley 134 on a vertical shaft 135. The latter is mounted in brackets 136 on the pedestal 2 and has belt pulleys 137, 138 connected by belts 139, 140 with the cope pulleys 116, 117 to drive the coping heads.

At the end of the machine by the adjustable pedestal 3 the cope driving mechanism is the same as that already described, excepting that the pulley on the shaft 16, and indicated at 141 is longitudinally movable with the pedestal. The shaft causes the rotation of said pulley by a feather 142 fixed in the shaft and engaging a groove in the pulley hub. Referring to Fig. 7, 142^a is a bearing cast with or attached to the pedestal 3.

143 is a quill or sleeve fitting the shaft 16 and feather 142, and having a smooth bearing and rotary in the bearing 142. At each end said quill has an enlargement 144 which serves as a shoulder to abut against the end of the bearing 142 and is provided with a recess 145, in one of which recesses fits the hub 146 of the pulley 96^a and in the other of which fits the hub 147 of the pulley 141. Said hubs are held in place by set screws 148. When therefore the pedestal 3 is adjusted the pulleys 96^a and 141 are carried with it without any interruption of the operation of the machine.

Much difficulty has been experienced in piping away the shavings from tenoning machines. As ordinarily constructed the machine bed requires two short sharp bends in the shavings duct which are repeatedly clogging so as to require the machine to be stopped.

According to my improvements the machine is formed with a long low bed on which rest the pedestals 2, 3 carrying the cutters at such height that the shavings conduits for the lower cutters, shown at 149, 150, can descend with a gradual bend or sweep through which the shavings will readily pass into the horizontal part 151 of the conduit. This latter is made in telescoping sections 152, 153, 154, 155, provided with catches 156 which prevent said sections from separating. The section 152 is attached to the branch 149, the section 154 to the branch 150, the section 153 connects the parts 152 and 154, and the section 155 joins the part 154 with the down pipe 157. The conduit 158 for the top cutters is similarly extensible as seen in Fig. 1.

What I claim is—

1. In a tenoning machine the combination with the low base plate, pedestals thereon, one of which is movable, tenoning devices carried by the pedestals, a pipe or conduit carried by the movable pedestal, a pipe leading therefrom to a tenoning head on said movable pedestal, and a pipe from a tenoning head on the fixed pedestal extensibly connected with the first mentioned pipe, said pipes being arranged above the base plate, and the pedestals being proportioned in height for such purpose, substantially as set forth.

2. In a tenoning machine, the combination with the pedestals carrying the tenoning devices and guides mounted thereon having bearing surfaces, of the feed chains running in said guides, and means for actuating them, said chains being composed of links cored out and hollow as described and having the top plate 36, bottom plates 37 adapted to run on said bearing surfaces, a tooth 39 joining the latter plates, and a connection 40 supporting said tooth, as set forth.

3. In a tenoning machine the combination with the pedestal, and the feed and tenoning devices thereon, of a frame or casing 58 having a series of pressers mounted thereon, and a hinged support for the casing consisting of the longitudinal arm 71 transverse to said casing, connected to the upper end thereof, and mounted on the pedestal by the transverse pivot 72, whereby said casing may be turned up out of the way of the tenoning devices, substantially as set forth.

4. The combination with the pedestal 2, and the adjustable pedestal 3 having the bearing 142^a, of the tenoning devices on said pedestals, the driving shaft 16, the quill 143 engaging and longitudinally movable on the shaft having a round journal in the bearing 142^a and on each side of the latter the enlargements 144, and pulleys 141, 96^a engaging the shaft directly and clamped to the ends of the quill, substantially as set forth.

5. The combination in a tenoning machine, with the tenoning cutter heads, and shafts and the supporting pedestals or frames therefor, of the slides or carriages on which the said heads and shafts are mounted, vertical guides for the same on the pedestals, the coping cutters, separate slides for the same mounted on the pedestals, and connections between the slides for the tenoning cutters and the slide for the corresponding coping cutter, as set forth.

6. In a tenoning machine the combination of the supporting frame having the guides 88, slides 86, 87 thereon, tenoning cutters and shafts on said slides, independent slides 122, 123 mounted on the other side of the frame, connections between the latter slides and the slides 86, 87, slides 119, 120 carried by the slides 122, 123, and means for adjusting said slides, as set forth.

7. The combination with the frame 73, of independent slides on opposite sides thereof, cutter heads carried by said slides, a screw connecting one of said slides with the frame, and a second screw connecting one of said slides with the other, as set forth.

In testimony whereof I affix my signature in the presence of two witnesses.

ELI B. HAYES.

Witnesses:
H. N. LOW,
J. S. BARKER.