

W. J. McNAUL.
TENONING MACHINE.

APPLICATION FILED JAN. 20, 1903.

NO MODEL.

3 SHEETS—SHEET 1.

Fig. 1.

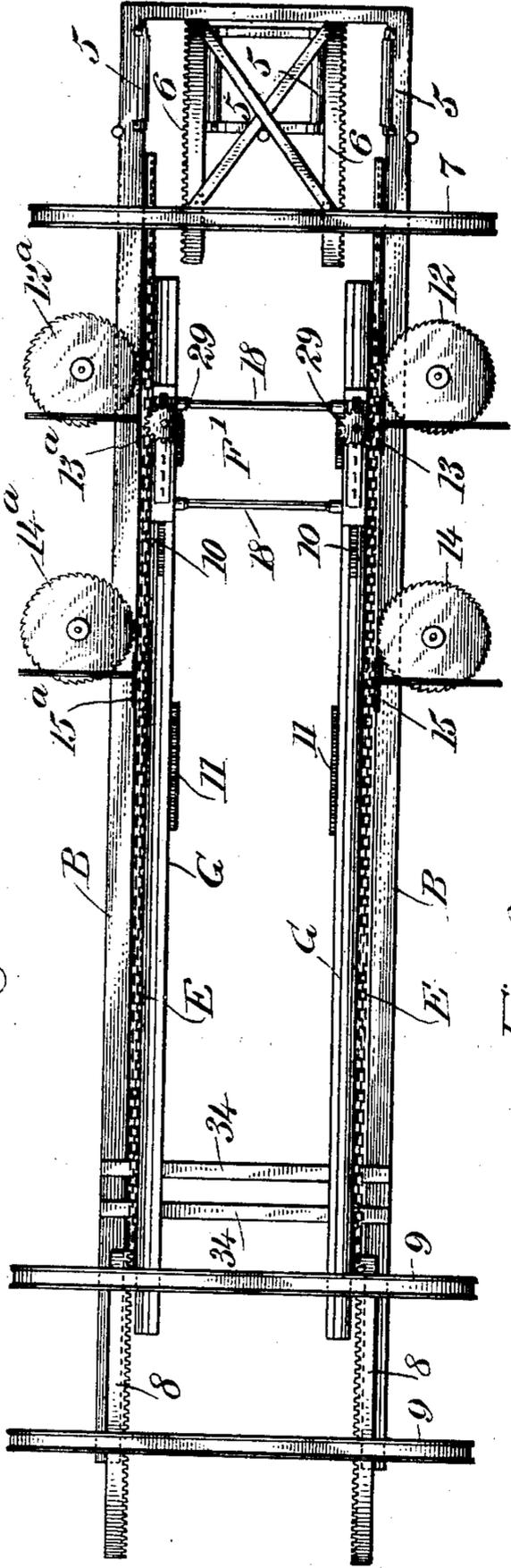
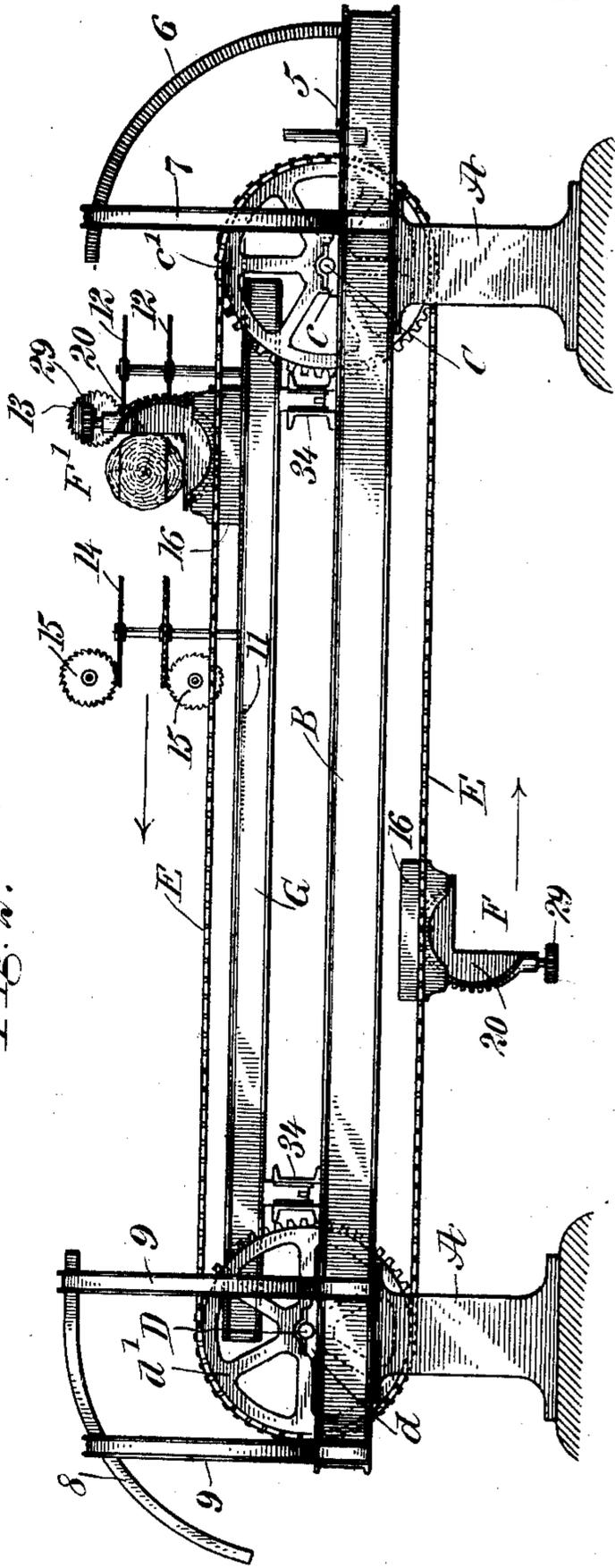


Fig. 2.



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3 SHEETS—SHEET 2.

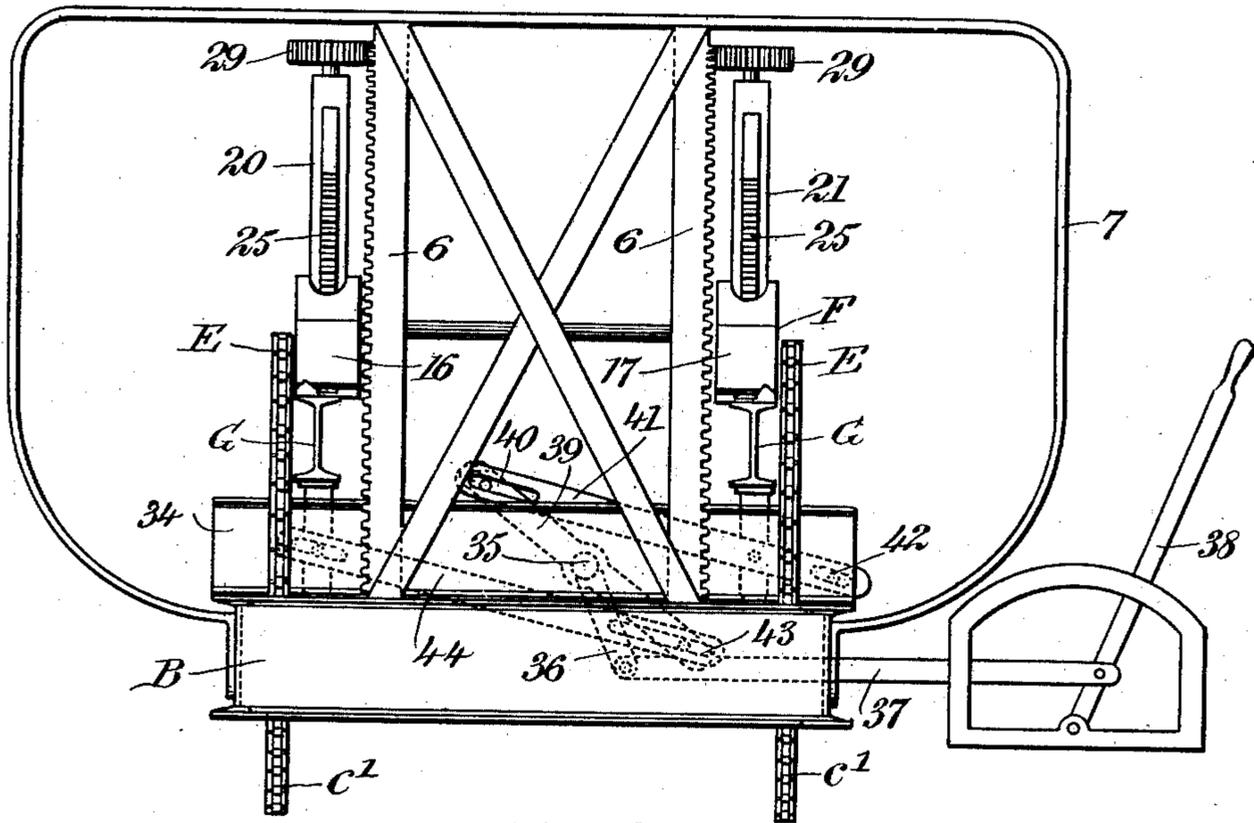


Fig. 3.

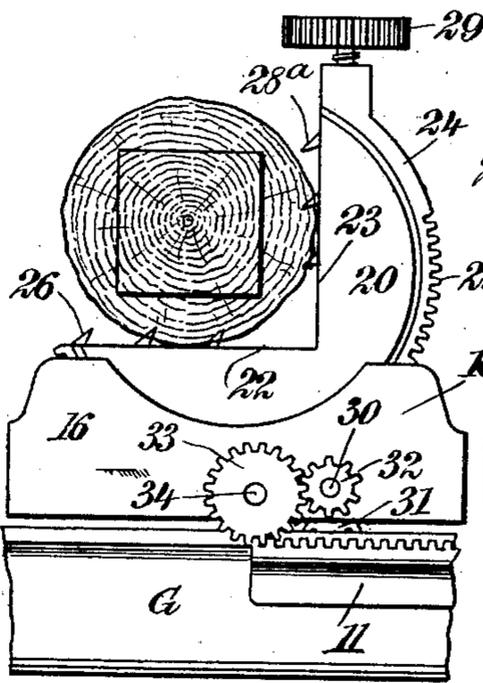


Fig. 6.

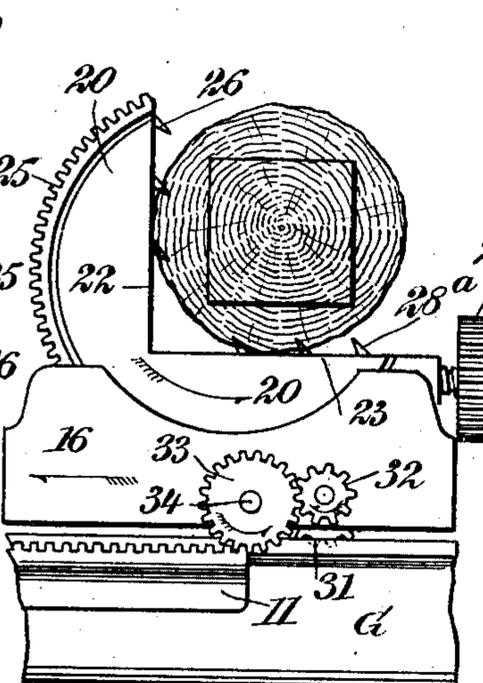


Fig. 5.

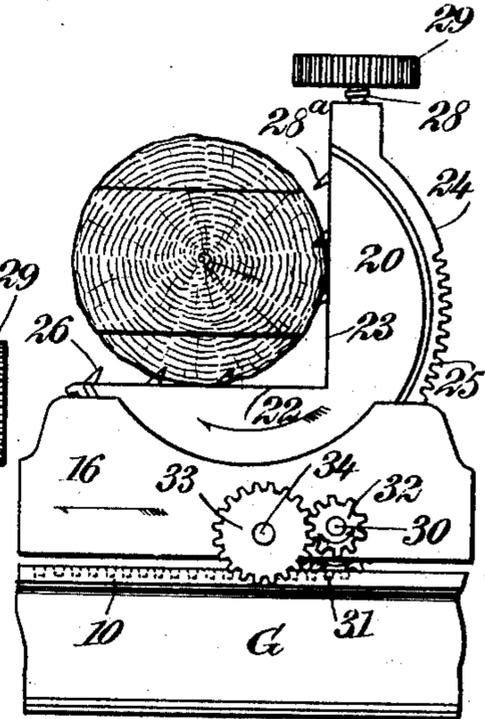


Fig. 4.

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No. 737,450.

PATENTED AUG. 25, 1903.

W. J. McNAUL.
TENONING MACHINE.

APPLICATION FILED JAN. 20, 1903.

NO MODEL.

3 SHEETS—SHEET 3.

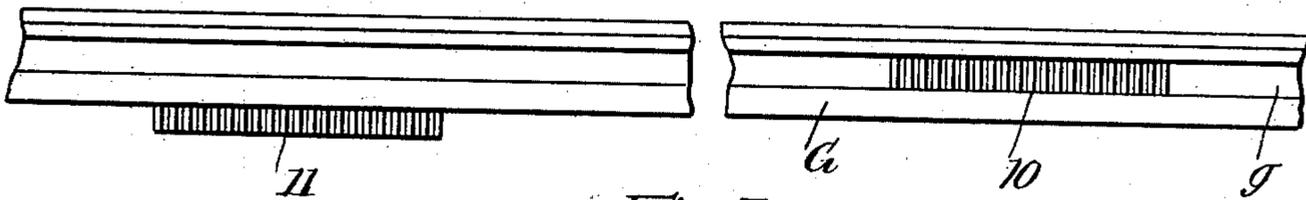


Fig. 7.

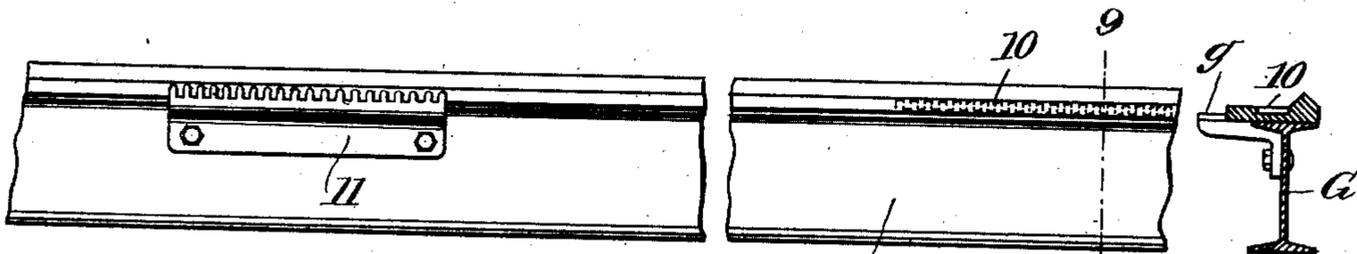


Fig. 8.

Fig. 9.

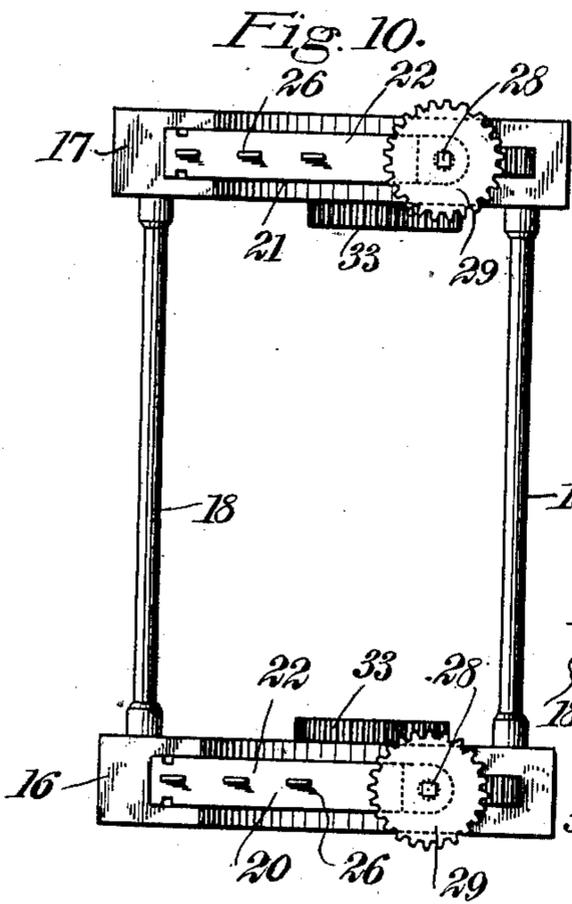
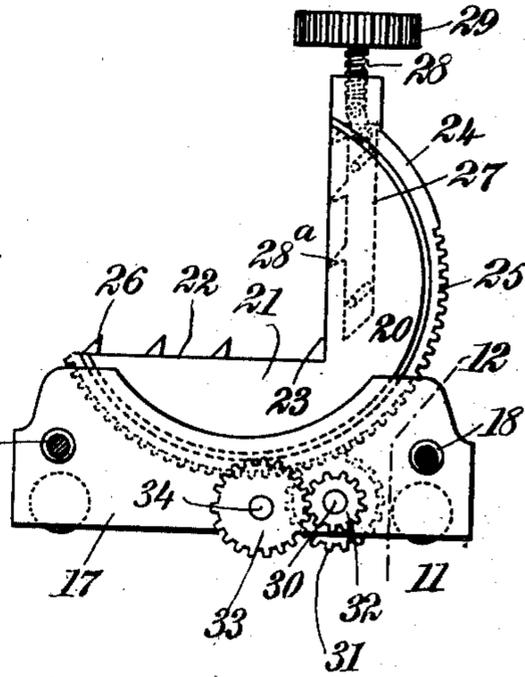
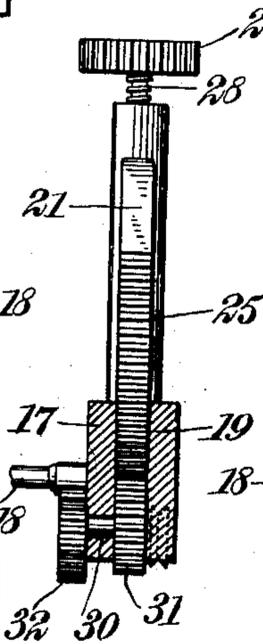


Fig. 10.

Fig. 11.

Fig. 12.



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UNITED STATES PATENT OFFICE.

WILLIAM JOHN McNAUL, OF BUTTE, MONTANA.

TENONING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 737,450, dated August 25, 1903.

Application filed January 20, 1903. Serial No. 139,819. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM JOHN McNAUL, a citizen of the United States, and a resident of Butte, in the county of Silver Bow and State of Montana, have invented a new and Improved Tenoning-Machine, of which the following is a full, clear, and exact description.

This invention relates to improvements in machines for making tenons on one or both ends of timber adapted for use in shoring mines and for other purposes.

The improved machine embodies a carriage adapted to automatically load itself with a log and equipped with a dog which at one end of the machine is operated automatically to clamp the log, while at the other end of the machine the dog is released in like manner and prior to the discharge of the finished log from the machine. As the loaded carriage moves through the machine the log is presented to a gang of four saws, which operate in two directions to remove slabs from the ends of the log, after which the carriage is rocked or turned in a way to give a quarter-turn to the log. The continued movement of the carriage again presents the log to a second gang of saws, which operate on the partially-finished log to remove other pieces or slabs therefrom and to complete the tenons on the ends of the log. The carriage is now reversed or restored to its initial position, and as it approaches the delivery end of the machine the dog is retracted, and finally the log, with completely-formed tenons on its ends, is discharged automatically.

Further objects and advantages of the invention will appear in the course of the subjoined description, and the novelty will be defined by the annexed claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures.

Figure 1 is a plan view of a tenoning-machine constructed in accordance with this invention. Fig. 2 is a side elevation thereof. Fig. 3 is an end elevation looking at the right-hand end of the machine shown by Figs. 1 and 2. Figs. 4, 5, and 6 are enlarged detail views of one of the carriages, showing some of the different positions which it assumes as it is

carried through the machine. Figs. 7 and 8 are views in plan and side elevation, respectively, on an enlarged scale, of one of the main beams and showing the relation of certain racks thereon. Fig. 9 is a detail cross-section on the line 9 9 of Fig. 8. Fig. 10 is an enlarged plan view of one of the log-carriages. Fig. 11 is a detail sectional elevation, the plane of the section being indicated by the dotted line 11 12 of Fig. 12; and Fig. 12 is a view in side elevation of the log-carriage shown by Fig. 11.

A indicates a series of posts or columns which are suitably anchored to a foundation of masonry or other material, and said columns carry parallel beams B, which support the several operating parts of the machine, and thereby constitute the main frame. Near one end of the beams B are provided journal-bearings *c*, which support a shaft C, that is equipped with a pair of sprocket-wheels *c'*. The main frame is provided at its other end with shaft-bearings *d*, which support the driving-shaft D, that is equipped with a pair of sprocket-wheels *d'*, said shaft D being also provided with a suitable belt-pulley, (not shown,) whereby the shaft D constitutes the driving-shaft for the log-carriages, while the shaft C is an idle shaft. The sprocket-wheels *c'* *d'* are in alignment with each other and receive the endless sprocket-chains E, the same being capable of a traveling motion lengthwise of the machine and driven by the sprocket-wheels on the shaft D. The traveling chains constitute an endless carrier which is equipped with a series of log-carriages, (indicated generically at F F',) said carriages being peculiarly constructed, as hereinafter fully described.

The beams B project beyond the columns A at one end for a suitable distance to receive a series of idle rollers 5, (see Figs. 1 and 2,) said rollers being disposed lengthwise of the machine and arranged in a row across one end of the frame thereof, so as to place a log of the proper length on one end of the frame and in the path of the carriages which travel with the endless carrier. At the loading end of the machine I provide a pair of segmental racks 6, having the teeth on their outer edges, the racks being fastened at one end to the

beams B and having their upper overhanging ends fastened to a stay-bow 7, the latter being secured to the beams B. At the delivery end of the machine, adjacent to the shaft D, I provide other segmental racks, 8, which are formed with teeth on their inner opposing edges, (see Fig. 1,) and these racks are secured firmly to stay-bows 9, the latter being fastened to the beams B.

Above the beams B, constituting the main framework, I provide a pair of track-rails G, the same lying below the horizontal plane of the upper lead forming a part of the endless carrier for the log-carriages. These track-rails G extend practically from the shaft C to the shaft D, and they lie in the path of the carriages F F', so that the latter when loaded with the logs will ride on the track-rails. Each track-rail G is provided with two racks 10 11, the racks 10 being secured in corresponding positions on the rails G and the racks 11 likewise having corresponding relation on said rails G. The racks 11 are out of alinement and in rear of the racks 10, as more clearly indicated in Figs. 1, 7, 8, and 9. The rails G are furthermore provided with longitudinal channels *g* in the upper faces thereof, and in said channels are secured or formed the racks 10, whereas the racks 11 are formed on plates that are fastened to the inner or opposing faces of the rails G. Between the loading-point formed by the rollers 5 and the racks 10 on the rails G the machine is equipped with a gang of saws, (indicated at 12 12^a and 13 13^a,) each saw being carried by a suitable arbor and adapted to be driven in any suitable way. The saws 12 12^a are horizontal, while the saws 13 13^a are vertical, said vertical saws being disposed at one side of and close to the path of cutting of the horizontal saws 12 12^a, whereby the saws of the gang are adapted to cut in two directions on the end portions of the log for the purpose of cutting pieces of material from said log preparatory to forming the tenons on the end portions of the same. A similar gang of saws is disposed adjacent to the track-rails G and in positions between the racks 10 and 11 thereon, said second gang of saws contemplating the employment of horizontal saws 14 14^a and vertical saws 15 15^a, said saws being disposed relatively to each other in the same way as the first-described gang of saws.

I will now proceed to describe the construction of the log-carriages F F'; but as these two carriages are constructed and operated in the same way a description of one will answer for the other. Each carriage has a pair of bed-plates 16 17, united firmly together by cross-rods 18, which fasten the bed-plates firmly to corresponding links of the endless chains that form the traveling carrier. The bed-plates 16 17 are provided with slots 19, forming guideways which receive the reversible log-carriers 20 21. Said log-carriers are each

cast in a single piece of metal in a way to produce flat faces 22 23 and a segmental edge 24, said segmental edge being provided with a series of gear-teeth which constitute a segmental rack 25. The faces 22 23 of each carrier lie at right angles to each other, and said face 22 is provided with a series of teeth 26. The part of the log-carrier having the face 23 is adapted to receive a slidable dog 27, having a series of teeth 28^a, as indicated by dotted lines in Fig. 12, and this dog is adapted to slide in the carrier in a way to project its teeth beyond the edge 23 when said dog moves in one direction. The dog is provided at one end with a nut adapted to be actuated by a screw 28, having threads of coarse pitch, and this screw is equipped with a spur gear-pinion 29, the latter adapted to engage with one or the other of the racks 6 or 8 as the log-carriage travels through the machine.

The bed-plates 16 17 of each log-carriage are also provided with short shafts 30, each having at one end a spur gear-pinion 31, adapted to mesh with the segmental rack 25 on the reversible log-carrier. Each shaft 30 is also provided at its other end with a gear-pinion 32, the latter having intermeshing engagement with an idly-mounted gear-pinion 33, carried by a short stub-shaft 34, attached to one of the bed-plates of the carriage. The gear 33 lies in a different plane from the gear 31, and said gears 31 33 are adapted to have intermeshing engagement with the racks 10 11, respectively, as the log-carriage travels along the track-rails G.

I have also equipped the machine with means for leveling the track-rails G in order that timber of different sizes may be advantageously cut to produce tenons thereon without requiring a change in the positions of the gangs of saws. The adjusting means for the track-rails G is indicated more clearly by Fig. 3 of the drawings, although a part of this adjusting mechanism is shown by Figs. 1 and 2.

Channel-irons 34 are secured in pairs to the frame-beams B, adjacent to the sprocket-gears *c' d'* on the endless-carrier shafts. In each pair of channel-irons 34 is mounted a rock-shaft 35, having a depending arm 36, to which is pivoted one end of a link 37, the other end of which link is pivoted to a hand-lever 38. This rock-shaft 35 carries a double-armed lever 39, one end of which has a slotted connection at 40 with a lever 41, the latter being fulcrumed at 42 and operatively connected with one of the track-rails G. The other end of said lever 39 has a slotted connection at 43 with another lever, 44, fulcrumed on the main frame in any suitable way and operatively connected with the other track-rail G. By moving the lever 38 in one direction the shaft 35 is turned to rock the double-armed lever 39, which in turn operates the levers 41 44 to raise the track-rails G simultaneously; but by reversing the lever 38 the described

toggle mechanism operates to lower the rails G in like manner. It will be understood that a lever-and-toggle mechanism is used in connection with the track-rails G at each end of the machine, and the levers 38 may be readily adjusted by hand for the purpose of raising or lowering the rails G, as may be desired.

The operation of my machine may be described as follows: Assuming that the endless carrier is driven from the shaft D to make the carriages travel in the direction indicated by the arrows in Fig. 2, a log is placed by hand or otherwise on the rollers 5 at the loading-point of the apparatus. The carriage F travels with the endless chains around the sprocket-wheels *c'* and presents the carriers 20 21 below the log resting on the rollers, thus automatically loading the carriage with a log as it moves around the sprocket-gears at one end of the machine. As the carriage is raised from the inverted position (shown at F in Fig. 2) the gears 29 thereof mesh with the teeth of the racks 6 in a way to rotate the screws 28, which in turn impart the slidable movement to the dogs 27, thus forcing the teeth 28^a of said dogs into the log and making the two groups of teeth 26 28^a hold the log firmly in place in the space bounded by the edges 22 23 of the carriers which form parts of the log-carriage. The log is automatically clamped in the carriage, and as said carriage moves toward the left its bed-plates 16 17 rest on the rails G, the latter serving to take up the weight of the carriage and the log thereon and relieve the endless carrier in a measure from undue strain. Immediately after the loaded carriage leaves the racks 6 the log thereon is presented to the gang of saws 12 12^a and 13 13^a, which operate in two directions to cut slabs from opposite sides of the end portions of the log, leaving the latter in the condition represented by Figs. 1 and 4, thus preliminarily cutting or treating the log to form tenons at the end portions thereof. The continued movement of the carriage toward the left and after passing the first gang of saws brings the carriage to the position of Fig. 4 and the gears 31 into engagement with the racks 10 on the rails, whereby the gears 31 are rotated, and they operate on the segmental racks 25 of the log-carriers in order to impart a quarter-turn to the carriers and the log clamped thereon, thus changing the position of the carriers and the log from that shown in Fig. 4 to the position shown by Fig. 5. With the log-carriers and the log in the position shown by this last-mentioned figure the log is moved by the carriage into operative relation to the second gang of saws, (indicated at 14 14^a 15 15^a,) which saws also operate in two directions on the end portions of the log and cut other pieces or slabs therefrom in a manner to complete the formation of the tenons at said end portions of the log, as will be more readily understood by reference to Fig. 5. The continued movement of the carriage toward the left and after

passing the second gang of saws brings the spur-gears 33 into engagement with the racks 11 of the rails, whereby these gears are turned and they operate on the intermediate gears 32 in a way to turn the shafts 30 in an opposite direction to the rotation imparted thereto by the gears 31 when in engagement with the racks 10. The engagement of the gears 33 with the racks 11 causes the log-carriers and the log to be turned from the position shown in Fig. 5 to that shown in Fig. 6. The carriage with its load continues to move toward the delivery end of the machine in a way to bring the gears 29 into engagement with the teeth of the racks 8, and this operation reverses the rotation of the screws 28 and withdraws the dogs 27 and the teeth thereof from engagement with the log. The dogs having been retracted the log is released from its detaining devices on the carriage, and as the latter passes around the sprocket-gears *d'* the log is automatically discharged from the delivery end of the machine.

The described operations take place in connection with each of the carriages F F', and these operations serve to automatically load the log on the carriage, to clamp the log firmly on said carriage, to preliminarily cut the log, afterward automatically reverse the carriage and the log, subject the log to the final cutting operation in a way to complete the tenons, to reverse the carriage and return the log in a completed condition to the normal position, to release the log from clamping engagement, and finally discharge the log automatically from the carriage.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. A machine of the class described, having a log-carriage, a gang of saws including a pair of horizontal saws and a pair of vertical saws disposed to cut work on said carriage in intersecting paths, another gang of saws including pairs of horizontal and vertical saws, the second gang of saws being spaced relatively to the first gang, a log-carrier on the carriage, means for giving a traversing movement to the carriage relatively to the gangs of saws, and means for giving a quarter-turn to the log in the interval between its presentation to the gangs of saws.

2. A machine of the class described, having two spaced gangs of saws, each gang including a pair of horizontal saws and a pair of vertical saws arranged to produce intersecting cuts in opposite sides of the work, a log-carriage, a reversible log-carrier mounted on the carriage to move a log between upper and lower pairs of vertical and horizontal saws, and means for giving a quarter-turn to a log on said carrier in the intervals between its presentation to the saws of the first and second gang.

3. A machine of the class described, having a log-carriage, means for giving an endless

traveling movement to said carriage, two gangs of saws disposed in the path of the feed of the carriage and operable in different directions to cut the ends of a log on said carriage, a
 5 clamping mechanism on said carriage, means in the path of the carriage and operable to set the clamping mechanism into engagement with the log prior to the presentation of the latter to the first gang of saws, means for re-
 10 versing the position of the log on said carriage at a point between the two gangs of saws, means for reversing the log-carrier after the carriage passes the second gang of saws, and means for automatically releasing the log-
 15 clamping mechanism from the log prior to the discharge of the latter from the machine.

4. A machine of the class described, having two gangs of cutters spaced relatively to each other, each gang including a pair of vertical
 20 cutters and a pair of horizontal cutters arranged to act on work in intersecting paths, a log-carriage, means for imparting a traversing movement to the log-carriage with respect to said cutters, a reversible log-carrier mounted
 25 on said carriage for movement therewith and operable to carry a log between upper and lower cutters, means for giving a quarter-turn to the log-carrier in the interval between the presentation of the log to the two gangs of cut-
 30 ters, a log-clamping mechanism on said reversible log-carrier, and means for setting the log-clamping mechanism into engagement with the log before the latter is presented to the first gang of cutters.

35 5. In a machine of the class described, the combination of a traveling carrier, a log-carriage thereon, a log-clamping dog on said carriage, a screw controlling the movement of said dog and provided with a pinion, and
 40 a rack disposed in the path of said pinion to rotate the screw and adjust the clamping-dog.

6. In a machine of the class described, the combination with a frame, and an endless carrier, of a carriage movable with said end-
 45 less carrier, a clamping-dog on said carriage, a shaft having a pinion and arranged to control the movement of the clamping-dog, and oppositely-disposed racks lying in the path of the pinion on said dog-adjusting shaft and
 50 operable to automatically set and release said dog as the carriage approaches said racks.

7. In a machine of the class described, the combination with a carrier, and two gangs of saws, of a carriage movable with said carrier,
 55 log-carriers mounted in said carriage and provided with segmental racks, stationary racks out of line with each other, and separate adjusting-gears movable with the carriage and arranged to respectively engage with said
 60 racks to automatically change the position of the log-carrier on said carriage.

8. A machine of the class described, having an endless carrier, a horizontal track, a carriage arranged to travel on the track and mov-
 65 able with the endless carrier, two gangs of cutter devices in spaced relation to each other,

a reversible log-carrier mounted on the carriage, means for imparting a quarter-turn to the reversible log-carrier after it passes one
 70 gang of cutters and previous to its presentation to the second gang of cutters, and means for restoring the log-carrier to normal position subsequent to its passage by the second gang of cutters.

9. In a machine of the class described, the
 75 combination of a track having disaligned racks, gangs of saws, a carriage provided with log-carriers, means for imparting movement to said carriage, and separate adjusting-gears mounted on the carriage and having opera-
 80 tive relation to the log-carrier, said gears arranged to engage respectively with the different racks and to turn the log-carrier in opposite directions as it approaches and passes one gang of saws.

10. In a machine of the class described, a
 85 log-carriage consisting of the bed-plates, log-carriers mounted in said bed-plates and having angular log-engaging faces and a segmental rack, shafts journaled in the bed-
 90 plates and provided with gears, certain of said gears meshing with the racks of the log-carriers, and idle gears meshing with other gears on said shafts, combined with a track having racks disposed out of line with each
 95 other and in the path of the gears on said carriage, and means for imparting traversing movement to said carriage.

11. A machine of the class described, hav-
 100 ing a frame provided with loading devices arranged to present a log in the path of a log-carrier, an endless carrier, a log-carriage movable with said endless carrier, a log-carrier mounted on said carriage and presented thereby to the
 105 loading devices for automatically taking up a log therefrom, log-clamping devices on said log-carrier and occupying an inoperative position thereon when said log-carrier is presented to the loading devices, and subsequently
 110 effective devices in the path of the log-clamping devices for automatically setting the same into engagement with a log after the latter has been picked up by said log-carrier.

12. A machine of the class described, hav-
 115 ing a frame, vertically-movable rails ranging lengthwise of the frame at the sides thereof, means for raising said rails at will and holding them locked in their adjusted positions, an endless carrier, a carriage movable with
 120 the endless carrier and arranged to ride on the rails, a reversible log-carrier on said carriage, and means mounted on the rails in the path of the log-carrier for reversing the latter; said log-carrier-reversing devices being
 125 adjustable with the rails to occupy an operative relation to the reversible carrier at all points of adjustment of said rails.

13. A machine of the class described, hav-
 130 ing a frame, track-rails ranging lengthwise of the frame at the sides thereof, an adjusting lever fulcrumed at a point between the rails, links connecting the end portions of said

adjusting-lever with the respective rails and operable to simultaneously and uniformly raise or lower said rails, means for operating the adjusting-lever, an endless carrier, and
5 a carriage movable with the carrier and arranged to ride on the rails.

In testimony whereof I have signed my

name to this specification in the presence of two subscribing witnesses.

WILLIAM JOHN McNAUL.

Witnesses:

ROBERT J. SHORES,
F. E. BECKER.