

No. 651,946.

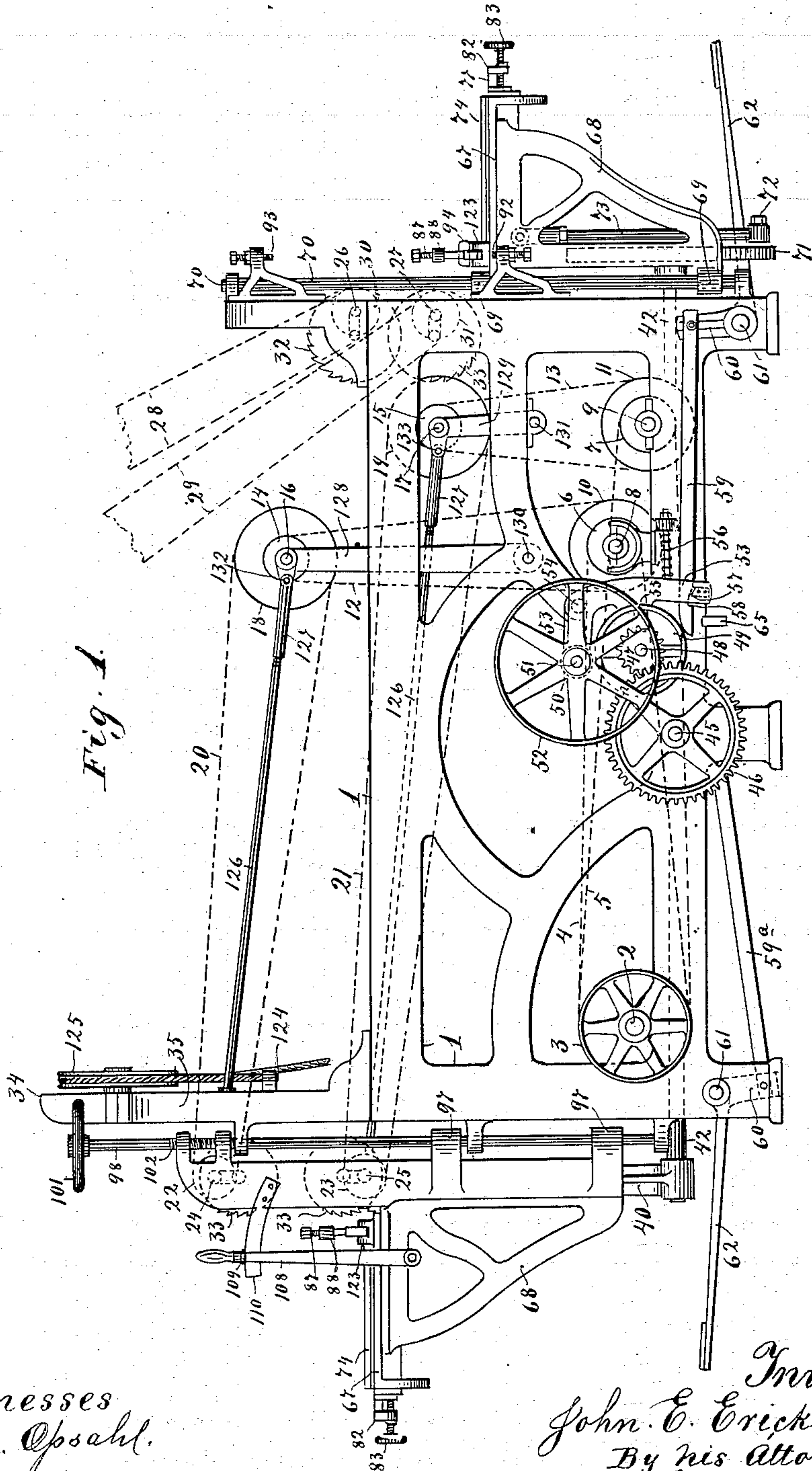
Patented June 19, 1900.

J. E. ERICKSON.
DOVETAILING MACHINE.

(Application filed May 25, 1899.)

(No Model.)

4 Sheets—Sheet 1.



Witnesses
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By his Attorney.
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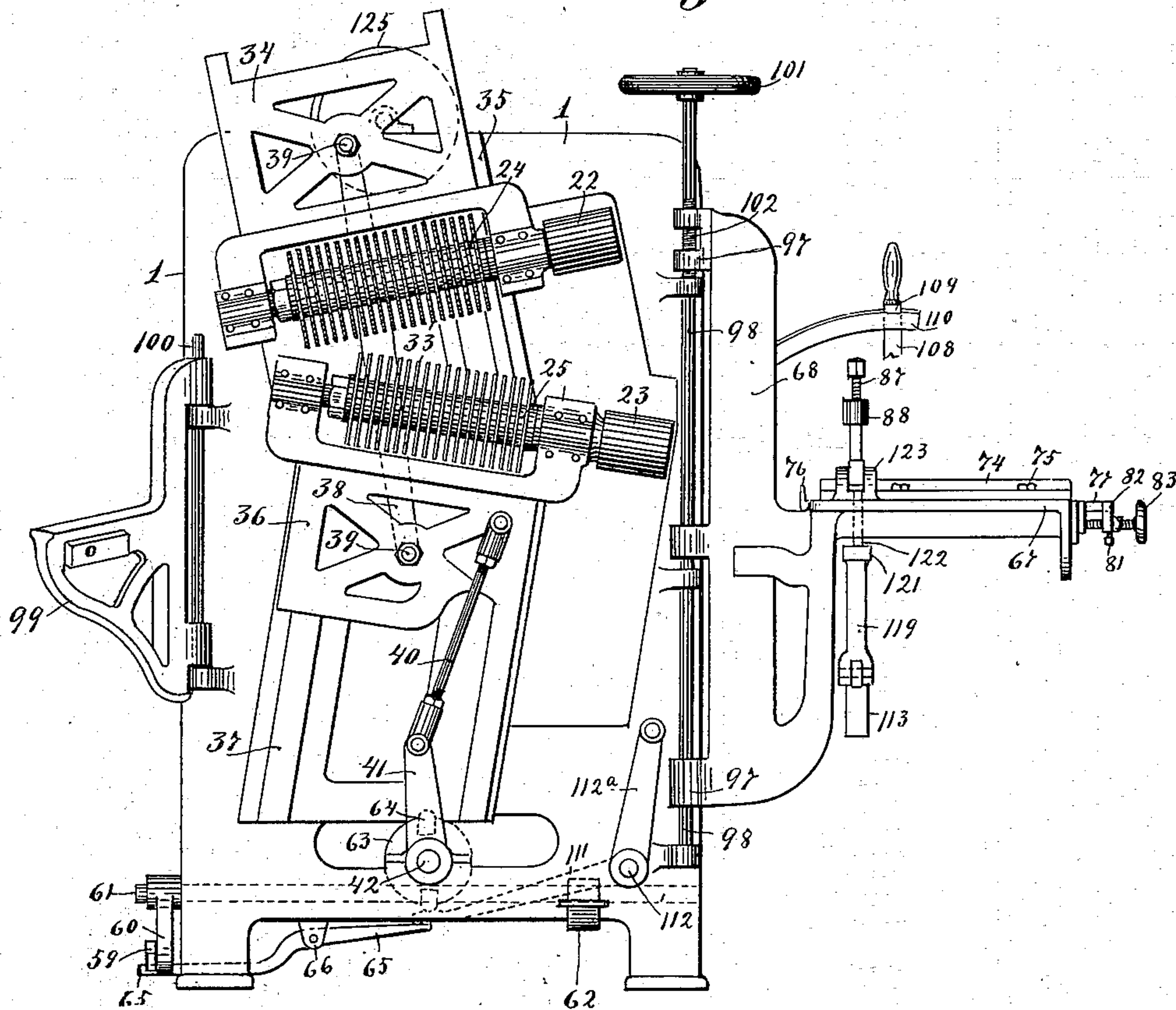
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Fig. 2.



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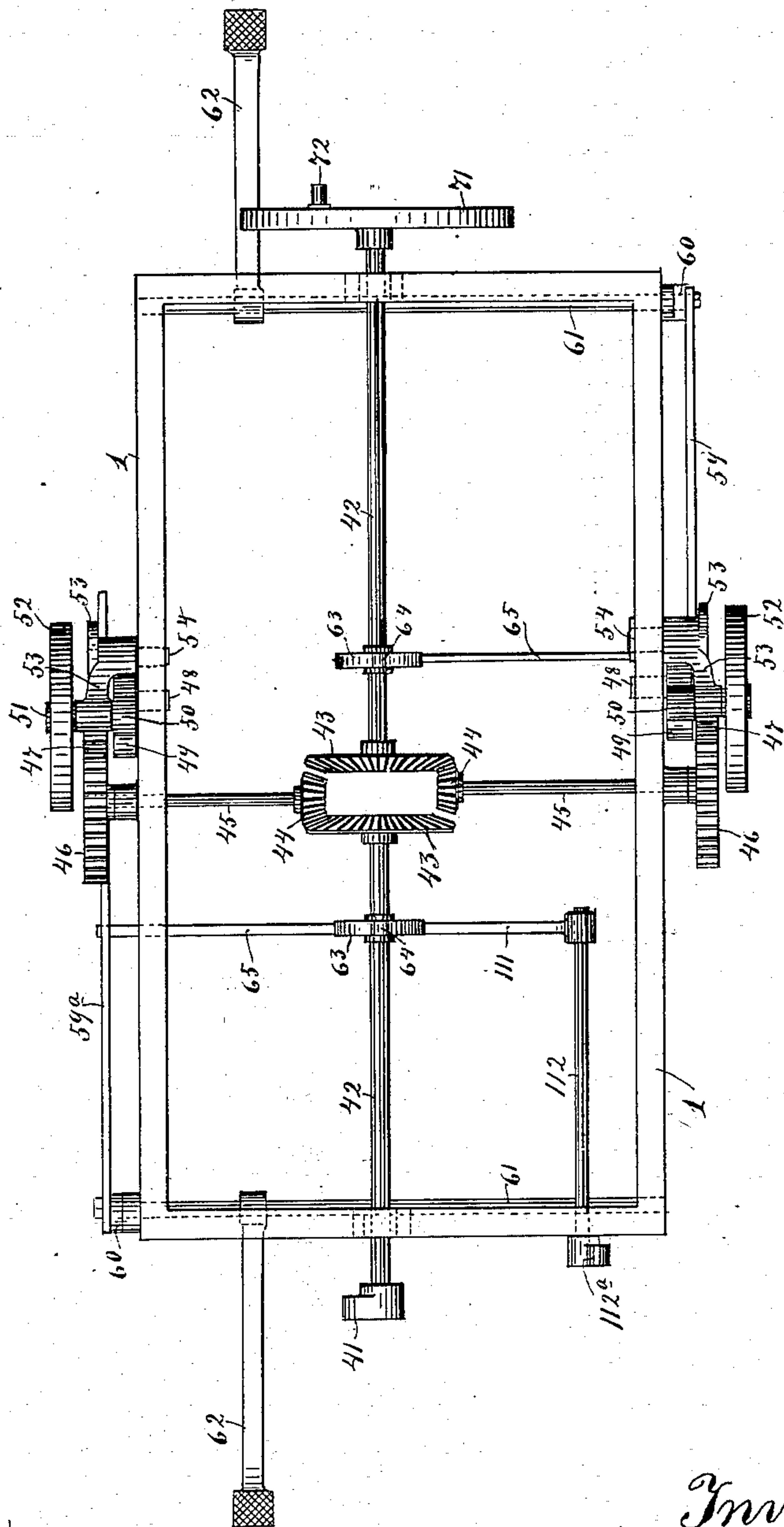
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Fig. 3.



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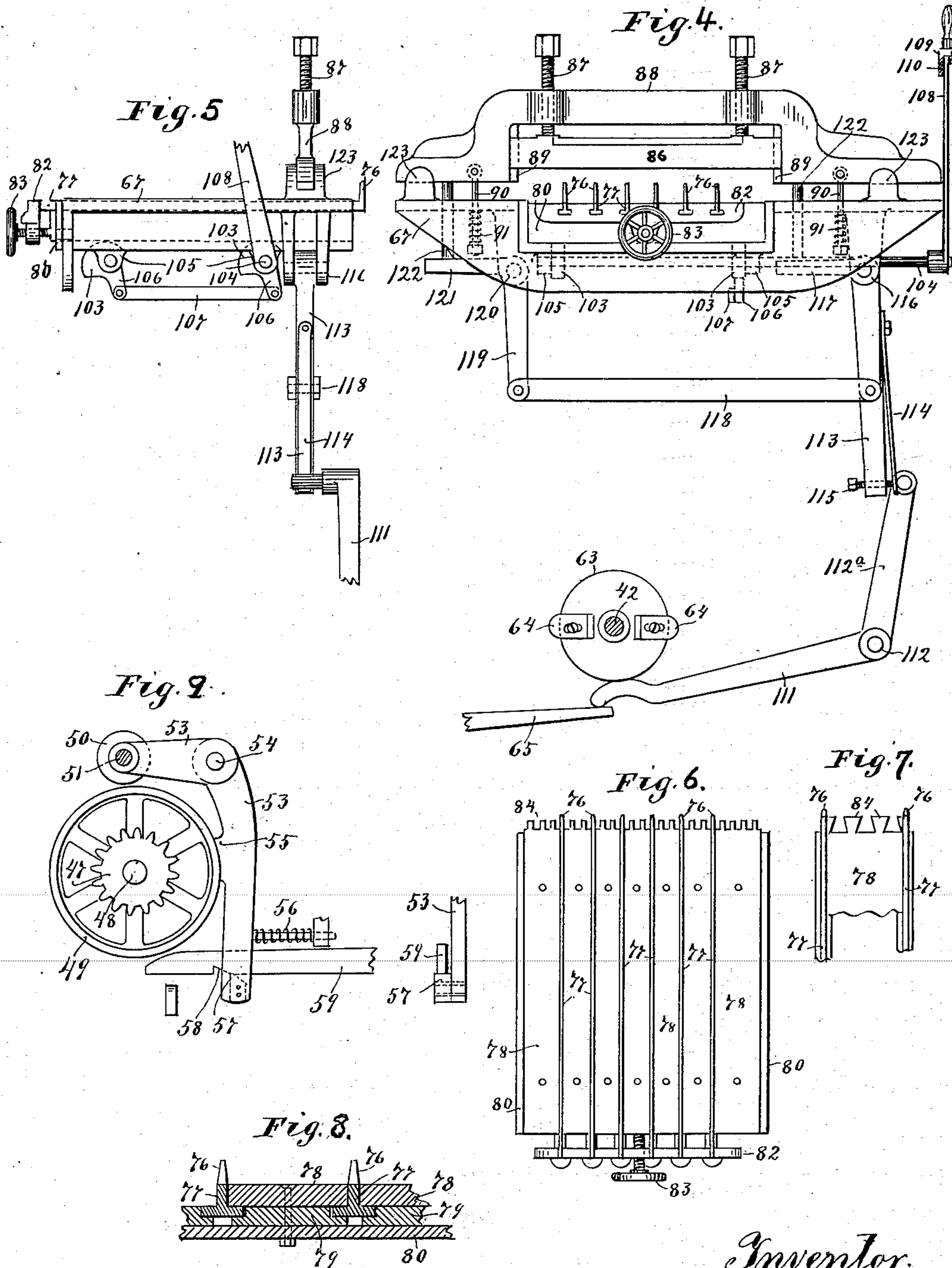
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4 Sheets—Sheet 4.



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UNITED STATES PATENT OFFICE.

JOHN E. ERICKSON, OF ST. PAUL, MINNESOTA.

DOVETAILING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 651,946, dated June 19, 1900.

Application filed May 25, 1899. Serial No. 718,137. (No model.)

To all whom it may concern:

Be it known that I, JOHN E. ERICKSON, a citizen of the United States, residing at St. Paul, in the county of Ramsey and State of Minnesota, have invented certain new and useful Improvements in Dovetailing - Machines, of which the following is a specification.

My invention relates to the type of dovetailing-machines illustrated by Patent No. 535,492, issued March 12, 1895, to John Leonardson and myself, in which the dovetails or mortises with receding sides are formed in the ends of boards carried on a reciprocating table, which coöperates with two sets of cutters of successively-increasing diameters and in which the tenons are formed in boards on a stationary table by the diagonal reciprocations of two sets of cutters of equal diameters. In the machine of the patent referred to the cutting of mortises was done only during the upward movement of the reciprocating table, and tenons were cut only during the downward thrusts of the cutter-carriers, the respective driving-cranks making complete revolutions before stopping.

It is one of the objects of the present improvements to so organize the operating mechanisms that they will stop automatically at each half-throw of the cranks, and thus enable cutting to be done at each reciprocation of the table in the one instance and of the saws in the other.

A further object of the improvements is to provide devices operating automatically both to clamp the boards in place on the tables during the cutting operation and release them upon completion of the cutting.

Other improvements relate to convenient means for adjustment of parts for holding boards of different thicknesses, means for adjusting the board-guides relative to the saws, and other details of structure, all of which improvements tend to greatly increase the capacity of the machine for turning out finished work.

As the purpose of the machine is to prepare boards for making boxes, and especially to enable low-grade lumber to be used for packing-boxes and other cheap boxes, the importance of such improvements as facilitate the work, increase the output, and better adapt

the machine to successfully operate upon the cheaper grades of material is apparent.

The improvements are illustrated in the accompanying drawings, in which—

Figure 1 is a side elevation of the improved dovetailing-machine. Fig. 2 shows an elevation of the opposite end of the machine at which tenons are formed, the table being swung to one side to show more clearly the interior mechanisms. Fig. 3 is a plan view showing in outline the general arrangement of the mechanisms for reciprocating the table and saws, respectively. Fig. 4 is a detached view of devices employed at the tenon-forming end of the machine for controlling the board-clamping devices. Fig. 5 is a detached view of devices employed for adjusting a movable portion of the table and the clamp as required for boards of different thicknesses. Figs. 6, 7, and 8 are details of the devices comprising the adjustable portion of the table; and Fig. 9 is a detached view of a portion of the friction and brake devices used in starting and stopping the saw and table reciprocating mechanisms.

In the drawings, 1 designates the machine-frame, 2 the main driving-shaft, and 3 the pulley thereon, connected with a source of power. For driving the arbors of the tenon-cutters, which are at the same end of the machine as the shaft 2, pulleys on the latter shaft are connected by belts 4 and 5, respectively, with pulleys 6 and 7 on shafts 8 and 9 at the opposite end of the machine, and from pulleys 10 and 11 on the latter shafts, respectively, belts 12 and 13 are run to pulleys 14 and 15 on shafts 16 and 17 near the top of the frame, and from pulleys 18 and 19 on the latter shafts belts 20 and 21, respectively, are run to the pulleys 22 and 23 on the upper and lower saw-arbors 24 and 25. The saw-arbors 26 and 27 at the other end of the machine are rotated by belts 28 and 29 on pulleys 30 and 31, connected with overhead shafting. (Not shown.)

The saws 32 on the arbors 26 and 27 are circular and of successively-increasing diameters, the series forming a contour like the frustum of a cone. The several saws of the series may be separated by washers and connected in any well-known manner. These saws have their edges beveled to a common

plane and are placed in such positions relative to each other and to the bed that they may cut dovetail mortises by two successive cuts, as referred to in my former patent.

5 The cutters 33 on the arbors 24 and 25 are of equal diameters and are preferably circular saws separated by washers or otherwise suitably spaced and secured. The upper arbor 24 is mounted on a frame or sash 34, arranged
10 to slide in angularly-arranged guides 35, provided on the main frame, and the arbor 25 is similarly mounted on a sash 36, arranged to slide in guides 37, inclined in direction opposite that of the guides 35. A bar 38 is connected by pivots 39 to central portions of
15 these sashes, so that their reciprocatory movements will be made in unison. A pitman 40 is pivoted at one end to the sash 36 and at its opposite end to a crank-arm 41 on a shaft 42, that is mounted in bearings on the base portion of the machine-frame and extends centrally inward. A complete rotation of this shaft will obviously cause one downward and one upward reciprocation of the connected
25 frames and the saws they carry.

On the inner end of the shaft 42 is a beveled gear 43, and in mesh with it is a beveled pinion 44 on a shaft 45, that extends laterally to the outside of the frame and there carries a
30 gear-wheel 46. In mesh with the latter gear is a pinion 47 on a shaft 48, which carries also a friction-wheel 49, the shaft having suitable bearings on the base member of the machine-frame. Thus the rotation of the friction-wheel 49 causes the rotation of the shafting
35 and gearing just described, and thereby operates the crank 41 to reciprocate the saw-frames 34 and 36.

For engaging the friction-wheel 49 at intervals of time to revolve it a friction-wheel 50 is provided on a shaft 51, that carries a pulley 52, which is belted to a pulley on the main driving-shaft 2, whereby the shaft 51 and the friction-wheel it carries are kept in constant
45 rotation. The shaft 51 is mounted on the angular arm of a lever-frame 53, that is pivoted at 54 to a portion of the machine-frame and extends downward near the face of the pulley 49 to a point at the side of the base of the machine-frame. On the side of the lever
50 53, adjacent the friction-wheel 49, is formed or secured a brake-shoe 55 for engaging that wheel to stop its revolution. A spring 56, suitably arranged on the side of the frame 1, normally exerts tension against the lower portion of the lever and presses the brake against the wheel 49. Movement of this portion of the lever in direction away from the wheel serves to free the brake and at the same time
60 by reason of the angularity of the lever and its pivotal connection swings the shaft of the driving friction-wheel downward and brings the two friction-wheels in contact, and thus the gearing for producing reciprocation of the saw-frames is set in motion.
65

The lower end of the lever 53 is provided with a lug or catch 57 for engaging a notch

58 in a horizontal bar 59, which extends to the end of the machine and is pivoted to an arm 60 on a rocking rod 61, mounted transversely in the lower portion of the frame end.
70 To this rod is attached a foot-lever 62 in convenient position to be operated by a workman at the end of the machine. Pressure on this foot-lever serves to actuate the bar 59 lengthwise, and by engagement of the notch 58 in the bar with the lug 57 on the lever 53 turns the latter on this pivot sufficiently to cause contact of the two friction-wheels. It is obvious that so long as the friction-wheels are
80 in contact the saw-sash reciprocations would continue, but stopping devices, operating automatically at suitable intervals, are provided to prevent such continuous reciprocatory movements.
85

On the shaft 42 is a disk 63, having at two diametrically-opposite points projections 64 for engaging a lever 65 to depress it whenever the projections come in contact with it. This lever is fulcrumed to a bracket 66, and its outer arm extends beneath the longitudinal bar 59 and in position to lift it when the inner end of the lever is depressed by the projections on the disk 63. This lifting of the bar 59 frees its notch 58 from the catch 57
90 on the friction and brake-lever, and thus permits the spring 56 to exert its force against the lever to free the friction and apply the brake. As the cam projections 64 are at opposite sides of the disk it is apparent that the operation of the controlled mechanism will continue only during a half-revolution of the disk and that the succeeding cam engagement will depress the engaged lever, and thereby actuate the brake to stop further
105 movements. To renew the operation, the foot-lever must be released and returned to its elevated position, which is done by the force of a spring (not shown) connected in any well-known way. When so raised, the bar 59 is again in proper position to engage the catch in the friction-carrying lever 53 upon depression of the foot-lever. The devices at both ends of the machine for controlling the reciprocations of the saws in one instance and those of the table in the other are substantially the same, and the same reference-numbers are used for corresponding parts in both mechanisms.
115

The tables 67 at the opposite ends of the machine are similar in general structure and arrangement, the one being arranged to reciprocate vertically and the other to remain stationary, but adapted to be swung laterally on hinges, as shown in Fig. 2, to give access to the saws and other interior parts.
120 The reciprocating table (used in connection with the dovetailing-saws) is supported by a bracket-frame 68, having loose sleeves 69 on vertical guide-rods 70, that extend from the bottom to the top of the frame 1. On the outer end of the shaft 42 is a crank-disk 71, and to a pin 72 thereon and to the under side of the table 67 a pitman 73 is connected, so
125
130

that a throw of the crank will reciprocate the table upward on the rods 70 from the position shown in Fig. 1 to a point above the saws, where it will be stopped by the brake by the operation of the cam 63 on the brake connections. After a release of the foot-lever and subsequent pressure upon it the renewal of the crank movement will retract the table to its lower position, where it will be again arrested in the same manner.

The boards to be cut can be placed in proper position on the table by means of a guide 74, that prevents lateral movement and which is adjustable laterally on the table by set-screws 75, that pass through slots in its base, and other guides 76 at right angles to the former and adjacent to the saws, which limit inward movement of the boards. The latter guides are upward-tapering projections on bars 77 and are of proper size and suitably spaced to pass freely through the interstices between the saws. These bars are of T shape in cross-section, Fig. 8, and are held together in a series by intermediate flat strips 78 and underlying strips 79, that may have flanges, on which the bases of the bars 77 rest, and the strips 78 and 79 are clamped together by bolts and furnish ways for the lengthwise movement of the guide-bars 77. The whole series of bars and strips are placed in a frame 80. The outer end of each of these bars is adjustably secured by a set-screw 81 to a movable cross-piece 82. Thus each guide-bar by freeing its set-screw may be independently removed or adjusted, and the series may be adjusted lengthwise in unison by movement of the piece 82. The latter adjustment is made by a screw engaging the frame 80 and bar 82 and operated by a nut or wheel 83. The inner ends of the strips 78 are cut away, as shown in Figs. 6 and 7, to provide projections 84, corresponding with those remaining on the boards when the dovetails or tenons are formed, and such projections serve as supports for the edge of the board while it is being cut to prevent portions from being broken or torn off by the saws. The adjustable table-section thus built up and its frame 80 are placed in a corresponding recess 85 in the table-bed 67.

Boards are held in place on the table by a clamping-bar 86, suspended by screws 87 from the cross-piece of a clamp-frame 88 above the table. Ways 89 are provided to guide the ends of the bar, so that its position relative to the table can be adjusted as desired by turning the screw 87. From the under sides of this frame rods 90 extend downward through openings in the table and carry springs 91, which bear against the under side of the table and against nuts on the ends of the rods, thereby tending to draw the clamping-frame downward toward the table. Further movement of the table downward from the position shown in Fig. 1 will cause the ends of the clamp-frame to strike stops 92 on the frame 1 and remain stationary, while the

table will descend to the limit allowed by the throw of the pitman 73, and so the space between the clamp-bar 86 and the table will be widened to release the board for removal. Upon the upward reciprocation similar adjustable stops 93 near the top of the frame serve to arrest the movement of the outer ends of levers 94, the inner ends of which are pivoted at 95 to the frame 88 and are immediately fulcrumed on lugs 96 on the table. The obvious effect will be the separation of the table and clamp in the same manner as when the clamp-frame itself engages the lower stops in its downward movement. The stops 92 and 93 are adjustable up and down to regulate the extent of separation of the clamp and table as desired.

The table at the opposite end of the machine where the tenons are formed is hinged by knuckles 97 to a rod 98, so that it may be swung to one side, as indicated in Fig. 2. When in working position, the portion of the table opposite its hinged connection is bolted to a bracket 99, supported by a rod 100. This bracket is hinged on the rod so that it may be swung outward when not in use, as indicated in Fig. 2, to give better access to the interior parts. As the saws at this end of the machine reciprocate diagonally, it is necessary that the table be in a proper plane relative to the intersections of the planes of the movements of the saws in their reciprocations, so that the saws of the second series will pass through the kerfs at the one surface of the board that were cut by the saws of the first series. To enable the initial adjustment of the table to such position to be made, a hand-wheel 101 on the rod 98, which has a screw-threaded portion 102, may be turned to raise or lower the bed to the extent necessary, and afterward if from wear of parts or other cause it be found necessary to make slight vertical adjustment of the table it may be done in the same way.

The parts having been arranged for the cutting of lumber of a given thickness, to suitably change their positions for thicker or thinner boards the table and clamping device should be adjusted in opposite directions to an equal extent. This is done in reference to the clamp by turning the screws 87, and the corresponding adjustment of the table is effected by the raising or lowering of the adjustable portion carried by the frame 80 within the table-recess 85. For this purpose cams 103 on shafts 104, journaled in hangers 105 at the under side of the main table-frame, support the adjustable table-frame 80. To these shafts are attached arms 106, that are connected by bars 107, and to the end of one of the shafts 104 a hand-lever 108 is attached and is provided with a catch 109 for locking it at any desired point of adjustment on a segment 110, projecting from the upper portion of the frame 1. The movement of the lever-handle toward or away from the machine serves to raise or lower the ad-

justable table to the extent desired, and when the lever-handle is locked the parts will be held in position.

For the purpose of raising the clamping-bar 86, so that boards can be freely inserted or removed while the reciprocating saws are stationary, there is provided an arrangement of levers to be operated by the same cam-disk 63 that serves to stop the saw reciprocations. Upon the completion of a thrust a cam projection 64 engages the lower arm of a lever 111, that is fast to a rod 112, fulcrumed in the machine-frame, and carries on it an upper angular arm 112^a, which bears against the outer side of a depending lever-frame. The lower arm 113 of this frame has the upper end of a strip 114 attached to its side and an adjusting-screw 115 for varying the distance of the lower end of the strip from the arm to regulate the extent of the inward movement of the arm 113 caused by the throw of lever 112^a. The lever 113 is fulcrumed to the table-frame at 116 and has a lateral arm 117. A bar 118 has one end pivoted to the lever 113 and its other end pivoted to the lower arm of a lever 119, that is fulcrumed to the table-frame at 120 and has a lateral arm 121 on a level with the arm 117 of the lever 113. It is apparent that depression of the lower end of the lever 111 will swing the upper arm 112^a inward, and thereby rock the connected levers 113 and 119 on their fulcrums and correspondingly elevate their lateral arms 117 and 121. To utilize such movements for lifting the clamp from the board, pins 122, secured on the under side of the clamp-frame 88, are extended downward through holes in the table to points where they are engaged by the lever-arms 117 and 121 in their upward movements, and the clamp-frame is thereby lifted. In normal position the clamp-frame rests in seats 123 on the table-bed.

The saws 33, their frames 34 and 36, and the connected reciprocating parts are counterpoised by a weight (not shown) attached to the lower end of a rope 124, which runs over a grooved pulley 125 at the top of the machine and is connected to the frame 34 or 36, whereby the work of the driving-crank 41 is lessened.

To maintain uniform distances between the saw-arbors and the shafts that drive them during the vertical reciprocations of the former, radius-rods 126 are connected at their outer ends to the saw-frames and at their inner ends by forked arms 127 to the sides of the swinging frames 128 and 129, respectively, upon which the shafts 16 and 17 are journaled. The lower portions of the frames 128 and 129 are hinged at 130 and 131, respectively, to inner parts of the machine-frame, and as their upper portions are pivotally connected at 132 and 133 to the arms of the radius-rods they are capable of rocking movements, while the rods serve to maintain an

unvarying distance between the parts they connect.

To cut tenons, a board having been placed on the table with a lateral edge against the guide 74 and the inner edge against the guides 76, the clamp-bar 86 being at the time in its elevated position and the saws at one or the other of their extremes of movement, a depression of the foot-lever 62 will free the brake and bring the friction-pulleys in contact and start rotation of the shaft 42. The first operative effect of such rotation is to move the cam 64 from contact with the lever 111 and allow it to rise to contact with the face of the disk 63, which movement permits the springs 91 to pull the clamp-frame downward and clamp the board on the table. Further rotation of the shaft 42 will reciprocate the saws in their diagonal courses and cause them to cut tenons with beveled sides, each tenon being separately supported at the under side and protected from being broken or torn by the saws by means of one of the projections 84 or a guide-bar 77. When the limit of a reciprocation is reached, the second cam 64 will have engaged the levers 65 and 111, and the actuation of the former lever will cause the separation of the friction-wheels and application of the brake, and the actuation of the latter lever serves to lift the clamp from the board.

To form the dovetail mortises, the board is placed on the other table and guided and supported in the same manner. Upon depression of the foot-lever the brake is released and the friction-wheels brought together, thereby starting the rotation of the crank-shaft and the reciprocation of the table, the immediate effect of which is to release the clamp-frame from the stops 92 or 93 and permit the clamp-bar to descend to the board and hold it in place. As the table approaches the limit of its reciprocation, the stops 92 or 93 are again engaged and the clamp-bar lifted, and coincidentally one of the cams 64 depresses the lever 65, and the movement of the latter releases the foot-lever connection with the brake-lever and permits the brake to be applied to the friction-wheel to stop the operating machinery and hold it in place for the removal of the board.

The improvements shown and described relative to the mechanisms for forming the dovetail mortises are not made the subject of claim herein, but are claimed in a pending divisional application, Serial No. 724,914, filed July 24, 1899.

What I claim herein is—

1. In a dovetailing-machine, the combination with a stationary table and clamping devices for holding boards in place thereon, of guides and cutter-carrying frames therein, mechanism for reciprocating said frames to cause the cutters to engage the boards, a system of levers for lifting the clamp from the board, a cam operated by said reciprocating

mechanism to actuate said levers as the completion of each reciprocation is neared, and brake devices arranged to be coincidently set in operation by the same cam movement to stop the reciprocating mechanism, substantially as set forth.

2. In a dovetailing-machine, a stationary table, vertically-movable clamping devices thereon for holding boards in place, cutter-carriers, mechanism for reciprocating them past the table to cause the cutters to engage the boards, a cam operated by said mechanism, levers actuated by said cam for periodically lifting the clamp from the board, and brake devices arranged to be set in operation by the same cam movement to stop the reciprocating mechanism, substantially as set forth.

3. In a dovetailing-machine, the combination with connected cutter-carrying frames arranged to travel in diagonal courses, and a work-holder suitably fixed relative to the travel of the cutters; of a pitman and crank for reciprocating said frames; gearing, including an idle friction-wheel, for intermittently rotating the crank; a driving friction-wheel, a brake, and a rocking carrier therefor arranged to apply them alternately to the idle friction-wheel; an operating-lever and connections for engaging the carrier at will to bring the friction-wheels to contact; a tripping-lever for automatically releasing the connections to allow the carrier to rock in opposite direction to apply the brake; and a cam operated by the driving-gear to actuate the tripping-lever at each half-revolution of the crank, substantially as set forth.

4. In a dovetailing-machine, the combination with connected cutter-carrying frames arranged to travel in diagonal courses, and a work-holder suitably fixed relative to the travel of the cutters; of a pitman and crank for reciprocating said frames; gearing, including an idle friction-wheel, for intermittently rotating the crank; a driving friction-wheel, a brake, and a rocking carrier therefor arranged to apply them alternately to the idle friction-wheel; an operating-lever and connections for engaging the carrier at will to bring the friction-wheels to contact; a spring for rocking the carrier in opposite direction to apply the brake; a tripping-lever for automatically releasing said connections to permit the spring to so operate; and a cam operated by the driving-gear to actuate the tripping-lever at each half-revolution of the crank, substantially as set forth.

5. In a dovetailing-machine, a stationary table; vertically-movable clamping devices thereon for holding boards in place; cutter-carriers; a crank and gearing, including an idle friction-wheel, for rotating it; a driving friction-wheel, a brake and a rocking carrier therefor arranged to apply them alternately to the idle friction-wheel; an operating-lever and connections for engaging the carrier at

will to bring the friction-wheels to contact; a tripping-lever for automatically releasing the connections to allow the carrier to rock in opposite direction to apply the brake; a cam operated by the driving-gear to actuate the tripping-lever at each half-revolution of the crank; and lever devices arranged to be operated by the same cam movement to lift the clamp from the board, substantially as set forth.

6. In a dovetailing-machine, the combination with the main frame, diagonal guides and reciprocating cutter-carriers; of a table-frame, and an upright rod having a screw-threaded portion and arranged to vertically adjust and pivotally support the table-frame to allow it to swing laterally, substantially as set forth.

7. In a dovetailing-machine, the combination with reciprocating saw-carriers and a fixed table; of a clamp-carrying frame mounted on the table, a vertically-adjustable clamp-bar supported by said frame, a vertically-adjustable table-section underlying said bar, and a system of levers, shafts and cams for adjusting such table-section, whereby variations of the space between the clamp-bar and adjustable table-section may be apportioned as desired above and below a selected plane, substantially as set forth.

8. In a dovetailing-machine, the combination with reciprocating saw-carriers and a fixed table having a central recess; of a supplemental table-section in such recess, cams supporting the table-section, shafts carrying the cams, and levers for operating the cams to adjust the table-section in vertical direction, substantially as set forth.

9. In a dovetailing-machine, the combination with reciprocating saw-carriers and a fixed table having a central recess; of a vertically and longitudinally adjustable table-section in such recess; a frame, cams, shafts and levers for supporting the table-section and adjusting it in vertical direction, and a screw for adjusting it in its frame toward or away from the saws, substantially as set forth.

10. In a dovetailing-machine, the combination with reciprocating saw-carriers and a fixed table having a central recess; of a vertically and longitudinally adjustable table-section in such recess; said table-section comprising a frame, guide-bars and intermediate strips adjustably clamped together and supported in the frame; and devices arranged to support such table-section and to adjust it vertically and toward or away from the saws, substantially as set forth.

In testimony whereof I have hereunto set my hand this 19th day of May, 1899.

JOHN E. ERICKSON.

In presence of—

ERICK H. ERICKSON,
P. H. GUNCKEL.