No. 832,136. PATENTED OCT. 2, 1906.

E. R. LOCHMAN.

CARVING MACHINE.

APPLICATION FILED DEC. 21, 1903.

6 SHEETS—SHEET 1.

Fig. 3A.

Fig. 3B.

Fig. 1.

Fig. 2.

WITNESSES

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6 SHEETS—SHEET 2.

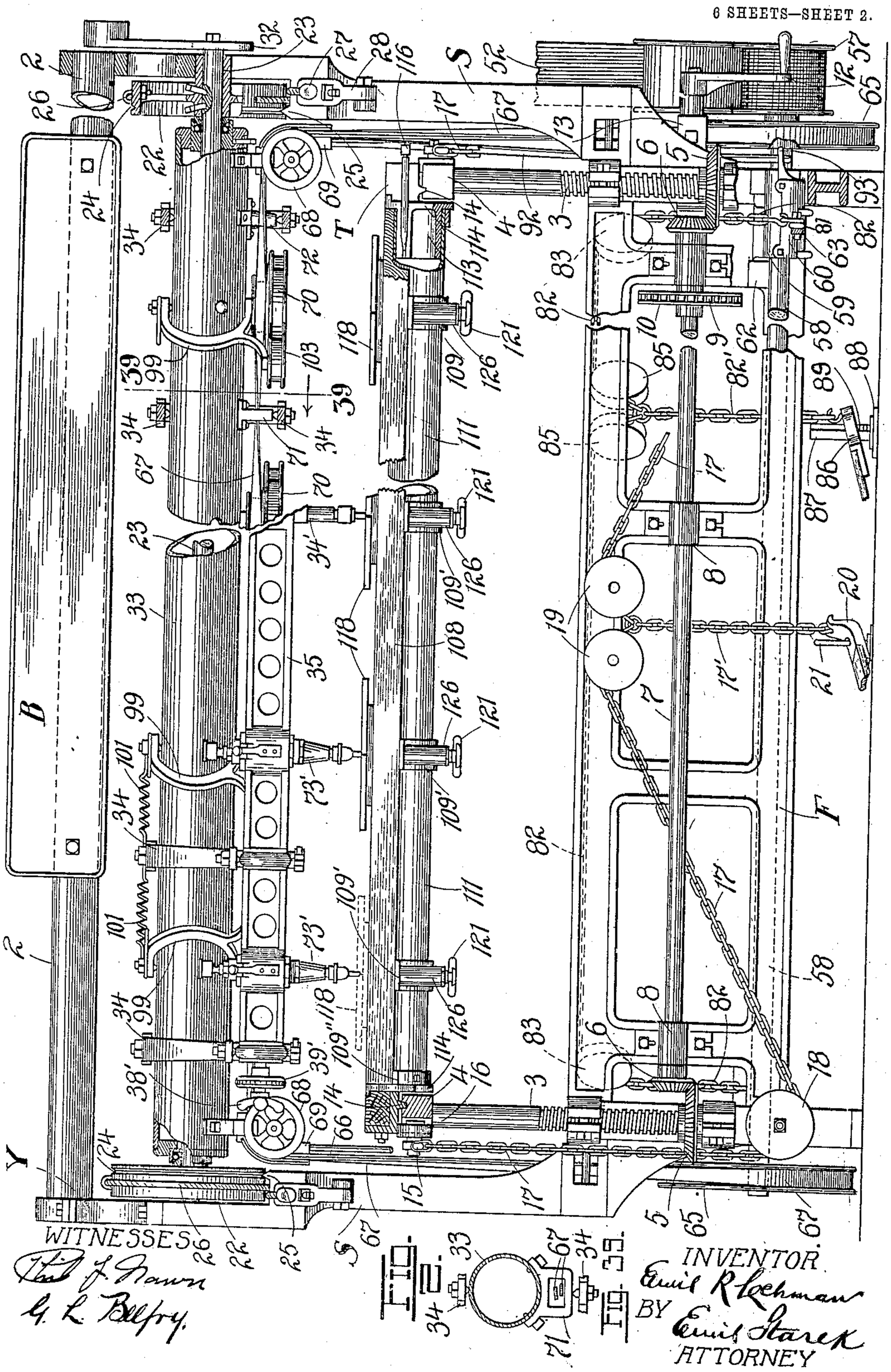

Fig. 12.

Fig. 13.

THE NORRIS PETERS CO., WASHINGTON, D. C.

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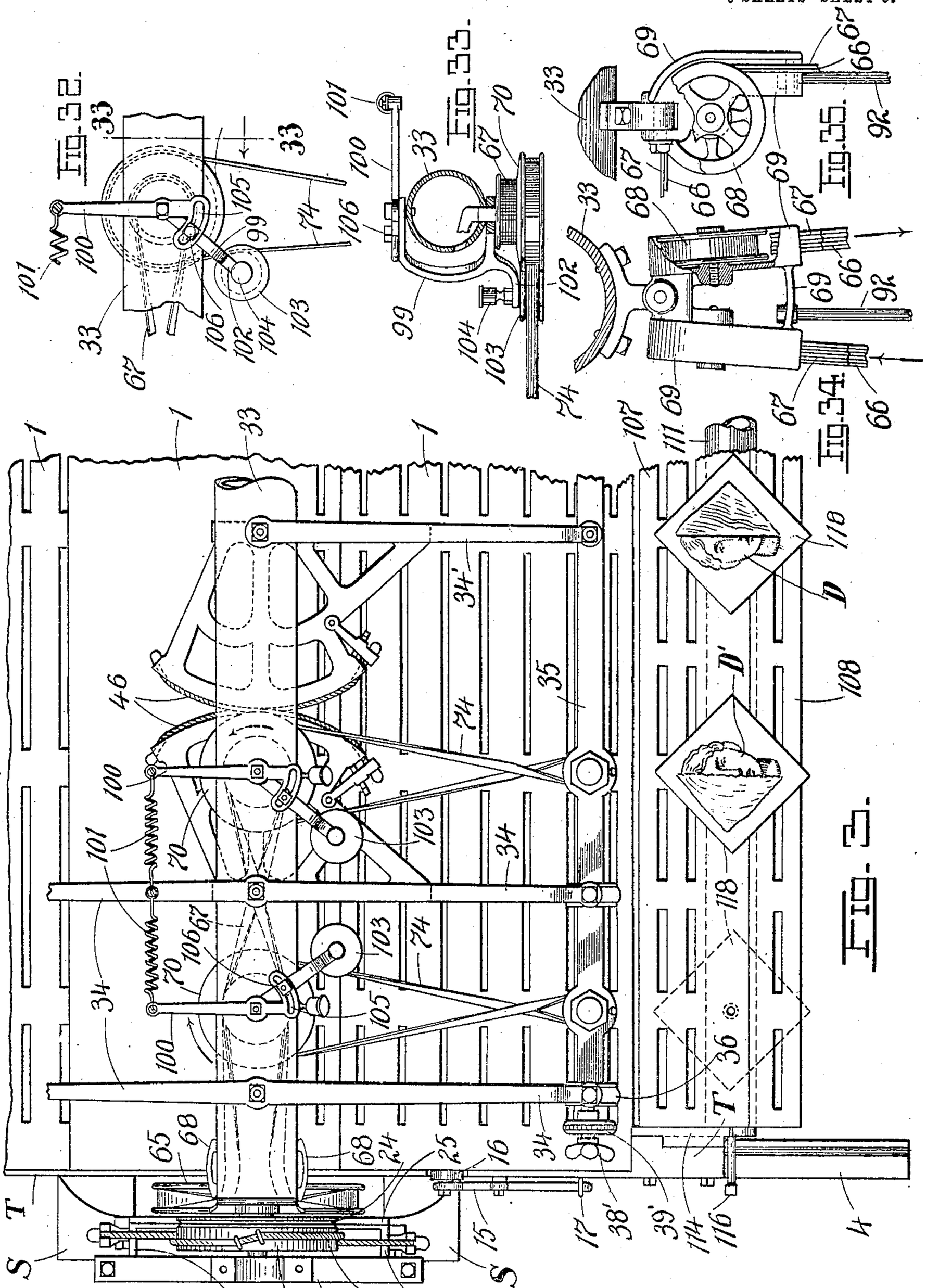

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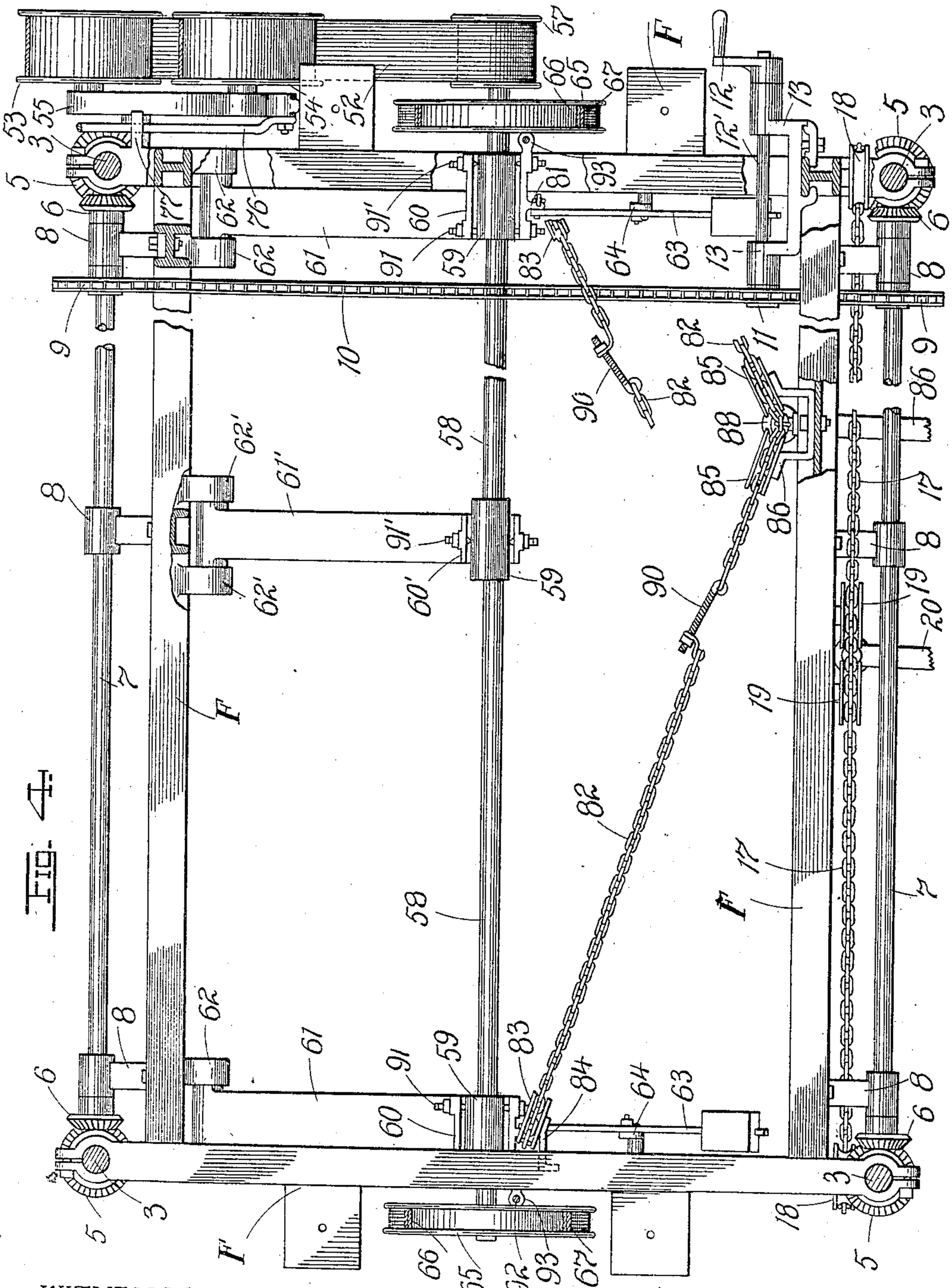

FIG. 4.

WITNESSES

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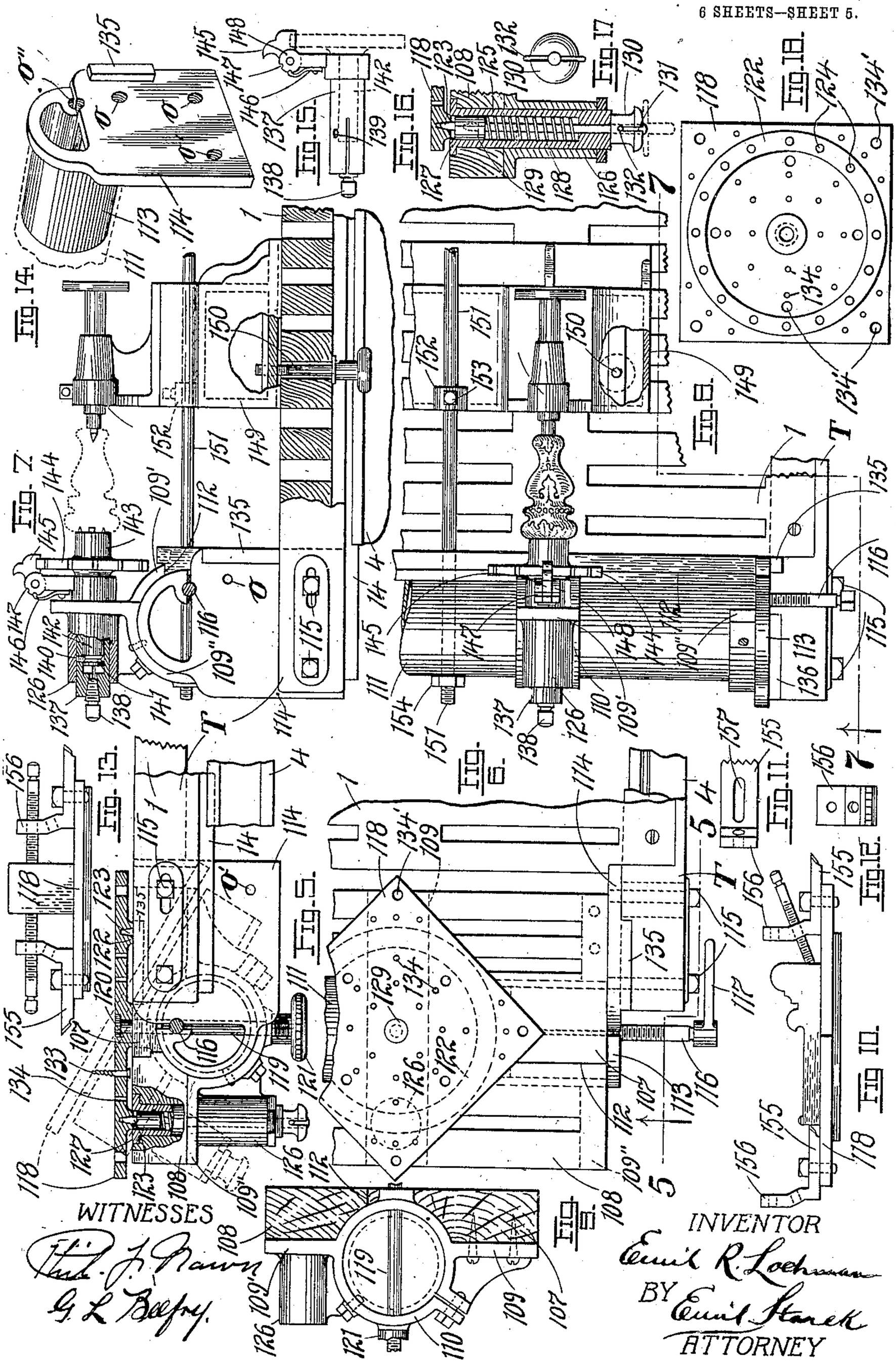
6 SHEETS—SHEET 5.



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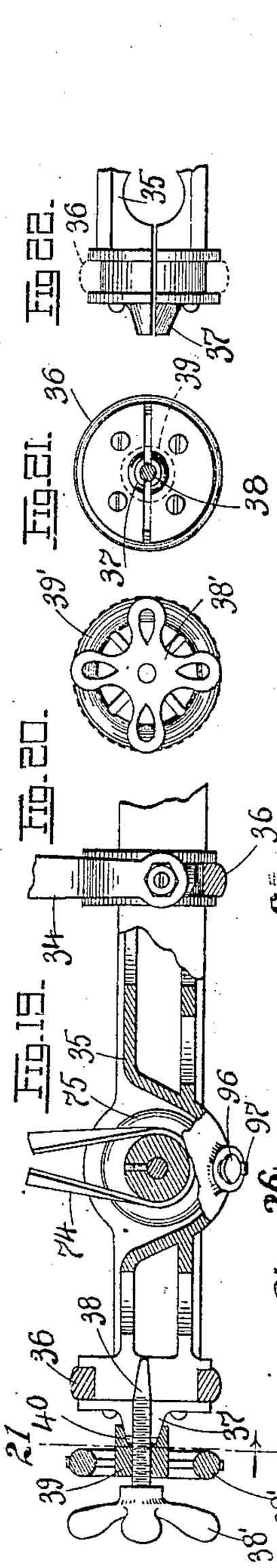
6 SHEETS—SHEET 6.



WITNESSES

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CARVING-MACHINE.

No. 832,136. Specification of Letters Patent. Patented Oct. 2, 1906.

Application filed December 21, 1903. Serial No. 186,021.

To all whom it may concern:

Be it known that I, EMIL R. LOCHMAN, a citizen of the United States, residing at St. Louis, State of Missouri, have invented certain new and useful Improvements in Carving-Machines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part hereof.

My invention has relation to improvements in wood-carving machines; and it consists in the novel construction and arrangement of parts more fully set forth in the specification and pointed out in the claims.

In the drawings, Figure 1 is a side elevation of the machine. Fig. 2 is a front elevation thereof, broken so as to show one-half with full equipments, a portion of the front being removed to show part of the rear mechanism. Fig. 3 is a plan view of one half of the machine, the opposite half being an exact counterpart. Fig. 4 is a plan of the lower portion of the machine, being a section in the plane of the horizontal line 4 4 of Fig. 1. Fig. 5 is an end view of the tilting extension of the stock-board, being a section on line 5 5 of Fig. 6 and showing also in section the plate mounted on said extension. Fig. 6 is a top plan of Fig. 5. Fig. 7 is an end view of the tilting extension swung to its vertical limit in conjunction with the tail-chuck employed under the circumstances for holding certain class of stock, being a section on line 7 7 of Fig. 8. Fig. 8 is a top plan of Fig. 7. Fig. 9 is a detail in side elevation of one of the clamping rings or bands which secure the tilting extension to the pipe about whose axis such extension revolves. Fig. 10 is a side elevation of one form of clamping-dog by which certain stock may be secured to the stock-board. Fig. 11 is a top plan of one of the dogs. Fig. 12 is an end view thereof. Fig. 13 is a view similar to Fig. 10, but showing another form of stock held between the dogs. Fig. 14 is a perspective of one of the terminal plates to which the rotatable pipe of the tilting extension is secured and about whose split tubular bearing the pipe may be permitted to rotate. Fig. 15 is a side elevation of the clutch adapted to secure the head-chuck to the tilting extension when the latter is to serve in the capacity of a chuck-support for treating stock of the character shown in Fig. 7. Fig. 16 is a middle section showing details of the construction of the spring-controlled locking-stem, serving to secure in proper position the stock-supporting plates carried by the tilting extension, together with the casing for such stem. Fig. 17 is an end view of Fig. 16. Fig. 18 is a bottom plan view of one of the stock-supporting plates carried by the tilting extension. Fig. 19 is a section on line 19 19 of Fig. 23, taken through the tool-supporting bar, showing the split end of the latter and the means for clamping it rigidly against rotation to the swinging arms carrying the same. Fig. 20 is a face view of the clamping-screw and adjusting-nut carried by the tool-supporting bar. Fig. 21 is a cross-section on line 21 21 of Fig. 19 with jam-nut, however, omitted. Fig. 22 is an elevation of the split end of the tool-supporting bar which is received by the ring at the end of the outer swinging arm of the series which support the bar. Fig. 23 is a front elevation of one end of the tool-supporting bar. Fig. 24 is a transverse section on line 24 24 of Fig. 23. Fig. 25 is a transverse section on line 25 25 of Fig. 23, showing in longitudinal section the holder for one form of tracer. Fig. 26 is a transverse section on line 26 26 of Fig. 23, showing in longitudinal section the tool-spindle and the adjustable pin or stop for holding the same against movement while attaching the bit or tool to the spindle. Fig. 27 is a bottom plan view of the lower member of the forked end of the swinging arm. Fig. 28 is an enlarged view similar to Fig. 26. Fig. 29 is a horizontal section on line 29 29 of Fig. 28. Fig. 30 is an end view of the tracer-arm, showing manner of coupling the same to the tool-supporting bar when the reverse cutting attachment is out of commission. Fig. 31 is a transverse section on line 31 31 of Fig. 30. Fig. 32 is a plan of the improved belt-tightener for the drive-belt actuating the tool-spindle. Fig. 33 is a transverse section on line 33 33 of Fig. 32. Fig. 34 is an elevation showing detail of saddle for supporting the belts which impart rotation to the step-pulleys by which the tool-spindle-actuating belts are impelled. Fig. 35 is an end view of the saddle. Fig. 36 is an end view of the traveling carriage, showing the different positions the counterweight carried thereby assumes with the travel of the carriage. Fig. 37 is a perspective of the pedal-lever coupled to the chains which raise and lower the oscillating shaft from which the belts shown in Fig. 34 are impelled. Fig. 38 is a transverse vertical section of said lever, the notched post or standard along which the

same is locked being in elevation; and Fig. 39 is a cross-section on line 39 39 of Fig. 2, showing the casting through which pass the crossed horizontal laps of the outer belt leading from the oscillating shaft.

In its general underlying principles the present machine does not differ materially from that shown and described in United States Letters Patent No. 701,903, issued to me under date of June 10, 1902; but it differs from the patented machine in details, whose purpose and object is to overcome certain inherent defects which the present construction thoroughly eliminates, the new design being further characterized by additional and novel features which in themselves contribute to the new machine possibilities not possessed by the old one. Among these features may be enumerated the following: a tilting extension for the stock-board for supporting and treating special forms of stock, such as column-caps and similar short stock and under certain conditions, balusters, newel-posts, and the like; means for converting such extension into a head-chuck for supporting one end of stock on the order of columns, posts, and the like; a series of adjustable plates for supporting stock of limited size and special character; means for converting the tilting extension into a rigid continuation of the stock board or frame proper; special devices for facilitating the longitudinal travel of the operating-table; special devices for arresting the travel of the belts driving the tool-spindles; special tighteners for the belts immediately connected to the tool-spindles; special devices for taking up the slack of the belts leading from the main drive-shaft; a new and novel disposition of the belts generally; special and improved means for elevating and lowering the operating-table; an improved construction of track for the support of the traveling carriage; a special provision of counterweight for the carriage; an improved construction in the details for securing the tool-supporting bar to the oscillating arms; special means for taking up any play between the tool-supporting bar and the tracer-arm of which the reverse cutting attachment forms a part; a special stop for the tool-spindle in cases necessary to hold the latter stationary for purposes of attaching a tool or bit; special means for reducing the friction of the tool-spindle against the walls of the tool-casing, and other details of construction and design imparting advantages which will fully appear from a detailed description of the invention, which is as follows:

Referring to the drawings, F represents a suitable supporting-frame adapted to support the operating-table T, which in turn carries the stock board or frame 1. In reality the part T and 1 collectively form a table for the support of the stock, and the portion 1 may therefore be regarded as a part of the operating-table. In the present instance the stock board or frame is made sectional, (see Fig. 3,) so that any section may be removed at will, and in practice occasion often arises, as presently to be seen, to remove the forward section to allow for the tilting of certain class of stock (such, for example, as chair-arms and the like) mounted on the tilting extension of the table. Projecting from the frame at each end thereof are standards S for the support of the tool-carriage, the upper ends of the standards carrying the yokes Y, as in the patented construction, the yokes being connected by a tie member or pipe 2, carrying the name-plate B.

Like in the patent aforesaid, the operating-table is adjustable both vertically and horizontally, though the details of construction by which the adjustment is accomplished are different and in an eminent degree superior. Mounted at the corners of the frame F are adjusting screw-bolts 3 3, whose upper ends carry the tracks 4 4, on which the table is supported. Mounted about the base of each screw-bolt is an interiorly-threaded bevel gear-wheel 5, with which meshes the terminal bevel-pinion 6 of a shaft 7, supported in bearing-brackets 8, projecting from the frame, both in front and rear, (see Fig. 4,) one end of each shaft carrying a sprocket-wheel 9, coupled by a sprocket-chain 10. To this chain motion may be imparted from a sprocket-pinion 11, mounted on the axis of a crank-arm 12, the latter being carried in a vertically-adjustable bearing 13, bolted and clamped to the frame F, Figs. 1, 4. The bearing 13, while serving to support the shaft 12′ of the crank-arm 12, at the same time is capable of taking up any slack in the chain by an upward movement which forces the sprocket 11 against the chain. By turning the crank-arm 12 in the proper direction motion will be imparted to the chain, this in turn driving the shafts 7 and gear-wheels 5 and reciprocating the screw-bolts 3. The movement of the bolts in proper direction necessarily imparts a like movement to the operating-table, moving the same up or down, according to the direction in which the crank-arm 12 is turned.

To allow for a horizontal adjustment or feed of the table T along the tracks 4, the latter are provided with grooves for the reception of the longitudinal tongues 14, the tongue and groove properly guiding the table in such horizontal movement. In this respect the present construction does not differ materially from that covered in the patented device, but in the present machine I make a special provision whereby the friction incident to such horizontal adjustment is materially reduced, such provision consisting in means for raising one end of the table and supporting it on rollers on either side, whereby the

friction is materially reduced and the travel of the table materially facilitated. This raising or elevating device is as follows: Pivoted on either side near the front of each rail or track 4 is a vertically-oscillating lever 15, Figs. 1, 2, the end of whose short arm is provided with a roller 16, bearing against the under surface of the table T, the wall of the rail being suitably recessed to admit a free play for the roller. It is at once apparent that upon a slight depression of the long arms of the levers 15 the roller ends will be raised sufficiently to raise the table out of its grooves, leaving it supported at a single point only, (at the rear,) thereby facilitating its horizontal adjustment, the table under the circumstances more readily riding over the rollers 16 than it would with the tongues 14 frictionally engaging the full length of the walls of the grooves by which they are received. The mechanism by which the depression of the long arms of the levers 15 is effected is as follows: Secured to the free end of the long arm of each lever is one end of a chain 17, passing at the bottom over a grooved pulley 18 at the lower corner of the front of the frame, each chain continuing over a second pulley 19, placed in adjacent relation to one another, the ends of the chains being connected to a chain-section 17′, whose lower and is secured to one end of a foot-lever or pedal 20 capable of vertical oscillation and depression, as well as horizontal rotation about a standard or rod 21. The operator has thus only to depress the raised end of the pedal-lever 20 with his foot, when he can exert sufficient draft on the chains to simultaneously depress the long arms of the levers 15 and elevate their roller ends to accomplish the purpose specified. By mounting the lever 20 about a rod, such as 21, the pedal can be swung to any convenient position to be reached by the foot of the operator, and should the depressed end of such pedal be in the way of the operator as he stands in front of the machine it can be kicked out of the way, being that it is freely rotatable about such rod.

Like in my patented machine above referred to, the tool-carriage in the present case is supported on the standards S, the range of the reciprocations of the carriage being limited to the width of the housing within which the opposite ends of the tool-carriage shaft are confined. The composition of the carriage too corresponds, substantially, with that shown in the patent, except for some differences apparent from the following description: The supporting-wheels 22 for the shaft 23 thereof are each provided with a peripheral bevel-groove 24, engaging a corresponding track or rib 25 on the standard S for guiding the carriage. To effect a rapid alinement of the tool-carriage with the table, the ends of the cables 26, by which the carriage is held to the standards, are in the present instance provided with terminal heads 27, engaging the forked ends of the tension-adjusting levers 28, the latter being actuated and set to the required angle by the nuts 29 operating over the screw-bolts 30. The cables in the present instance are substantially even with the track over which the wheels travel, being passed over the ledges 31, Figs. 1, 3, formed at the ends of the track, this arrangement facilitating the removal and brushing away of shavings and dirt from the parts. In the present case the shaft 23 is provided at one end with an adjustable counterweight or balance-arm 32, (removed from Fig. 1 for the sake of clearness,) which with the advance of the carriage in either direction (dotted position, Fig. 36) oscillates with the shaft in the rotation of the latter, said arm 32 being present for the purpose of balancing the strains to which the carriage is subjected under the action and tension of the drive-belts coupled to the outer rotatable tube 33, forming one of the elements of the carriage, and to which belts reference will presently be made. At each end the tube 33 is pivotally embraced by the horizontally-swinging arms 34, the arms gripping the tube, so as to rotate the same about its axis when swung in a vertical plane the same as in the patented construction, save that in the present instance the capacity of the machine is increased by a second arm 34, and like in the patented construction the middle of the tube is provided with a detachable tracer-arm 34′, and the front ends of the arms carry the tool-supporting bar 35. In the present machine, however, Fig, 19, I make special provision for effecting any desirable rotary adjustment for the bar 35, such provision being as follows: The split ends of the bar 35 are each embraced by a ring 36, which the forked end of the arm 34 grips, Figs. 23, 24. Received by the interiorly-screw-threaded conical boss 37 of said split end is the threaded stem of the expanding-screw 38, the intermediate portion of this stem between the outer head 38′ thereof and the said boss carrying a jam-nut 39, having a terminal conical socket 40, adapted to encompass said boss and being provided with an operating-head 39′. The inner smooth end of the screw-stem 38 is tapering or conical, Fig. 19. It is apparent that by sufficiently unscrewing the stem 38 the bar 35 will become loosened in the ring 36 and can thus be adjusted about its axis to any desirable position. When once adjusted, the stem 38 is screwed inward until the members forming the split end are forced frictionally against the ring 36, after which the jam-nut 39 is driven home against the boss 37, thereby locking the parts. For "roughing" purposes, where undercutting is not essential and where the tool-spindles, as well as the tracer, shall be disposed with their axes substan-

tially at right angles to the operating-table, the rigid retention of the bar 35 after once being properly adjusted in the manner aforesaid may be supplemented by a specific connection between said bar and the tracer-arm 34′, Fig. 31, as follows: Mounted in the upper member of the forked end of the tracer-arm 34′ is a hollow screw-threaded sleeve 41, the expanded base thereof bearing directly on the upper face of the tool-supporting bar 35 and on the adjacent end of the bushing 42, inserted into the tubular opening formed in the bar, the bushing being secured by a screw 43. Through the opening of the sleeve 41 is dropped a locking-pin 44 of a length to partially extend into the bushing, the head 44′ limiting its descent by coming in contact with the sleeve 41, screwed into the arm 34′, a lock-nut 45 being passed over the sleeve 41 before the pin 44 is dropped into position. By this arrangement it is clearly apparent that a rigid connection for the purpose aforesaid may be effected between the tracer-arm and the tool-supporting bar. When it is desired to detach the free end of the tracer-arm 34′ from the tool-supporting bar, so as to allow said end to ride freely thereover under circumstances when the reverse cutting attachment is brought into requisition, the pin 44 is simply withdrawn, and any lost play between the arm and bar is taken up by carefully adjusting the sleeve 41 and when once adjusted locking the parts by the nut 45. (See Figs. 30, 31.) It is of course needless in this description to refer to the reverse cutting attachment and its mode of operation, as that is well known and old and fully described in the patent aforesaid and patents prior thereto, though it may be briefly mentioned that as the tracer-arm 34′ (to which one section of the reverse cutting attachment is secured) sweeps in one direction the bar 35, and the tools mounted thereon sweep in the opposite direction, making it possible from a certain pattern or design D, traced by the tracer, to produce the reverse counterpart D′ by the tool, Fig. 3, as fully covered by previous patents. Of course where the tracer-arm 34′ is coupled to the tool-supporting bar 35, as indicated in Fig. 31, the actuating straps or cords 46 of the rocking segments of the reverse cutting attachment must be removed. Where an actual removal of the tracer-arm 34′ is necessary to permit such a rotary adjustment of the tool-supporting bar as to allow for a different angular disposition of the tool-spindles with the plane of the operating-table, (a necessity which arises when undercutting or uppercutting is desirable,) then of course a distinct tracer must be substituted for that forming a part of the tracer-arm 34′. This tracer is illustrated in Fig. 25. It consists of a body portion or holder 47, having a reduced stem 47′, the latter having an upper screw-threaded portion, over which a nut 48 may be passed. Upon removing the bushing 42 the stem 47′ is inserted into the bar 35, its position being carefully adjusted by the nut 48, after which it is secured by the screw 49. As already stated, this latter tracer is used on occasions when the necessity for the removal of the arm 34′ arises to allow the tilting of the tool-axes sufficiently to effect undercutting or uppercutting. That the bases of the arms 34 may come as close to the operating-table as possible the lower pivots by which the rings 36 are gripped are in the form of screw-tips 50, driven flush with the under surface of the arm and held in position between the split ends of the lower member of the fork of said arm, the ends so split being drawn together about the tip by means of the bolt 51, Figs. 23, 24, 27.

As the tool-carriage is directly connected to the main drive-shaft through intermediate belt connections, which allow for the reciprocation thereof under all circumstances, it will be in order at this time to describe these connections. What corresponds to the main drive-shaft in the patented construction is absent from the present machine, such main drive-shaft herein not being shown; but suffice it to say that the machine is operated from a main drive-belt 52, leading to such shaft, the lower portion of the belt passing over pulleys 53 54, mounted on top of a rock-frame 55, adapted to oscillate about a trunnion 56 at the base of the frame F, the belt finally passing over the terminal pulley 57 of an oscillating shaft 58, disposed parallel to the shafts 7 7. The shaft 58 is supported in bearings 59, mounted in saddles 60 60′ at the free ends of the vertically-swinging arms 61 61′, whose pivotal ends are supported in bearings 62 62′ at the base of the frame F. The shaft 58 is properly counterweighted or balanced by the weighted levers 63, whose one end is pivotally secured to the saddle 60 and at an intermediate point being secured to the lower end of a link 64, suspended from the frame F. Adjacent and interior to the pulley 57 the shaft 58 is provided at each end with a belt-pulley 65, over which pass the superposed laps of two separate and independent belts 66 67, the belts thence passing vertically upward over the axially-inclined guide-pulleys 68 of the hooded pulley-saddle 69, pivotally suspended from the tube 33 of the tool-carriage. The inner or shorter belt 66 passes around the reduced section of the step-pulley 70 adjacent to the saddle 69, and the longer or outer belt 67 spans such reduced section, thence crosses, and finally passes around the corresponding reduced section of the second step-pulley 70, the intersecting laps of the belt 67 thus crossed passing through a casting 71 at the base of tube 33, Figs. 2, 39. The parallel laps of the respective belts as they leave the saddle 69 pass

around the knob or teat 72, Fig. 2, said teat 72 and casting 71 serving, respectively, as one of the points of connection between the arms 34 and the tube 33. Of course the object of crossing the laps of the longer belt 67 is to impart a rotation to the second pulley 70 reverse to that of the first for purposes of neutralizing the jars incident to a rotation of all the tools in one and the same direction. As in the patented construction the tool-spindles 73, Fig. 28, are driven from the belts 74, passing, respectively, about the enlarged peripheral sections of the step-pulleys 70 and the pulleys 75, secured to the tool-spindles. From the connections described it is apparent that motion imparted to the drive-belt 52 will be communicated to the tool-spindles. It is apparent, of course, that the shaft 58 must be permitted to move up and down to accommodate the reciprocation of the tool-carriage, which as it travels back and forth draws on the belts 66 67, connecting said carriage to the belt-pulleys 65. In this respect this feature is the same as in my patent above referred to. In its vertical oscillations, however, the shaft 58 will exert a permanent but variable draft on the frame 55, causing it to rock back and forth about its axis, and unless corrected it would in these oscillations or rockings exert a variable draft on the belt 52. To keep the tension of this belt under the circumstances as uniform as possible, I provide the frame 55 with a belt-tightener in the form of a rod 76, pivotally linked to the frame, Figs. 1, 4, the rod having a screw-threaded portion passing loosely through a lug or bracket 77 on the frame F, the said portion being encircled by a spring 78, whose lower end is secured to a sliding ring 79, adapted to bear or be forced against the lug with a pressure determined by the tension imparted to the spring by the adjusting-nut 80. Once the necessary tension on the belt is secured by a proper adjustment of the spring 78 this tension will be preserved, since the spring will cause the pulleys 53 54 to hug up to the belt under all circumstances.

The vertical oscillations of the shaft 58 are, as previously stated, due to the draft exerted on the belts 66 67 by reason of the reciprocations of the tool-carriage, the pulley 65 being, however, at all times in frictional and driving engagement with said belts. When, however, it is desirable to stop the tools, I provide means for the disengagement of the pulley 65 from the belts referred to, this disengagement being effected by mechanism adapted to elevate the shaft 58 sufficiently to release the said pulley from the belts. This mechanism is as follows: Secured to a lug 81 of each of the saddles 60, in which the shaft 58 is supported, Figs. 2, 4, is one end of a chain 82, which passes over an adjacent pulley 83, supported by a bracket 84, the chains thence passing along the rear of the front of the frame F over the angularly-disposed pulleys 85, carried by a bracket 86, the adjacent ends of the chains being coupled to a single chain 82′, whose lower end is secured to the elevated end of a pedal-lever 86, capable of free oscillation in a vertical plane along a standard 87, Figs. 2, 37, 38, itself freely rotatable within a base-plate 88. The opening of the lever through which the standard 87 passes is of sufficient dimensions to allow the pedal more or less play in a horizontal plane. When the operator depresses with his foot the raised end of the lever 86, he draws on the chains 82, thereby elevating the shaft 58 and disengaging the pulley 65 thereof from the vertical drive-belts 66 67, bringing the tools to a standstill. In this position the pedal 86 may be locked by causing one side of the opening formed therein to engage one of a series of notches or teeth 89, with which the standard is provided. Should the lower end of the lever at any time be in the way of the operator, it may be kicked to one side, the rotatable condition of the standard within its base readily permitting this to be done. The chains 82 are preferably made in sections connected by a nut and screw-stem 90, whereby their lengths may be carefully adjusted so that a depression of the raised end of the pedal-lever 86, amounting to the depth of a single tooth 89 along the staff 87, will suffice to effect the necessary disengagement of the pulley 65 from the belts 66 67.

In the course of time the belts 66 67 on one side of the machine may stretch to a length not exactly corresponding to that of the belts on the opposite side, in which event the shaft 58 will not hang perfectly horizontal. To facilitate the slight tilting inevitable under the circumstances, I secure the tubular bearings 59 59 of the said shaft to the saddles 60 60′ by means of screw-bolts 91 91′, the latter having tapering ends about which the shaft can freely tilt in a vertical plane to allow for the difference in the elevaton between its opposite ends, the bolts 91 having blunt ends and bearing loosely against the shaft-bearings merely for purposes of steadying the parts, Fig. 4.

In view of the high velocity at which the belts 66 67 must travel to rotate the tool-spindles at the required speed it is essential that some provision be made against the too frequent slipping of the belts from the pulleys mounted in the hooded saddles 69. This danger is minimized by insuring rigidity for the saddle during the reciprocations of the tool-carriage and the oscillations of the tube 33 for the vertical sweeps of the arms 34. This rigidity is insured for the saddle 69 by the rod 92 projecting from the base of the saddle, the lower end of said rod playing loosely through a lug 93, forming a part of the casting 60, Figs. 2, 4. Of course the loose play of the rod 92 through the lug 93 is neces-

sary to allow for the free oscillation of the shaft 58.

As stated above, the belts 74 pass over the pulley 75 of the tool-spindles 73. The upper face of the pulley 75 in the present machine is provided with a diametrically-disposed depression or groove 94, at the base of which are adapted to rest the similarly-disposed limiting screws or pins 95, carried by the hollow tool-spindle, the position of these screws being so adjusted that there can be no possibility of the spindle ever being jammed into the tapering end of the spindle-casing 73′, a result always attended with increased frictional resistance to the rotation of the spindle and consequent overheating of the parts. With the construction as shown, however, the spindle 73 can never creep toward nor wedge itself forcibly against the spindle-casing, since the spindle and pulley operate as a single rigid unit, the bottom of the pulley resting on top of the spindle-casing. The groove 94, however, subserves another purpose—viz., for receiving the inner end of a peg or pin 96 when the latter has been forced inwardly the full limit to hold the pulley and tool-spindle steady and against rotation when the operator is equipping the tool with a new bit. When not in use, the peg 96 is withdrawn from engagement with the groove 94, but held in place on the bar 35 by the free end of a flexed spring 97, which enters one of two sockets or depressions 98, according to which of its two extreme positions the peg is occupying.

The disposition of the horizontal belts 74 is substantially the same as in my patent above referred to except that in the present instance they are crossed, one of the laps being equipped with a belt-tightener, which is so mounted as to readily adapt itself to the various positions assumed by the arms 34 in their horizontal and vertical sweeps. This tightener is in the form of a U-shaped frame 99, Figs. 3, 32, 33, capable of oscillation in a horizontal plane about the axis of rotation of the step-pulley 70, said frame having secured thereto a rearwardly-extending lever 100, pivoted about said axis, the free end of the long arm of the lever being connected to one end of a tension-spring 101, whose opposite end is fixed to the arm 34. The frame 99 also has a lower forwardly-projecting arm 102, whose under surface carries the idler-pulley 103, bearing against the lap of the belt, said pulley being lubricated from an oil-cup 104. The short arm of the lever 100 terminates in a curved loop or segment 105, along which the frame can be adjusted as to angular position (said position determining the tension of the tightener against the belt) and permanently secured to the lever 100 by the binding-nut 106. The parts thus clamped together oscillate as a unit with the various oscillations of the arms 34, the springs 101 under all conditions forcing the idlers 103 against the belts.

One of the most important features of improvement in the present machine is the front tilting extension of the operating-table, its importance being attributable to the uses to which the same may be put. It is best illustrated in Figs. 1, 2, 5, 6, 7, 8, and 9. This extension is made up of two sections of board 107 108, respectively, the former being secured by screws along one of the ledges 109 of a series of straps 110, distributed along and clamped to a rotatable pipe 111, disposed parallel to the front edge of the table T 1, and the latter merely resting on a similar series of opposite ledges 109′. It may be stated in passing that the ends of the pipe 111 are provided with ledges or brackets 109″ for affording terminal support for the member 108 of the tilting extension. The section 108 is additionally held in position by the section 107 by reason of the lap-joint 112, formed along the meeting edges of the two sections. (See Figs. 1, 5.) The opposite ends of the pipe 111 are mounted in the split tubular bearings 113 of the plates 114, by which it is secured to the table T. As best seen in Fig. 14, the plate 114 is provided with three screw-holes *o o o′* for the reception of the screw-bolts 115. When the bolts are passed through the openings *o o* of the plate 114, the latter occupies what may be termed a "horizontal" position therefor, (see Figs. 1, 5, 6,) the pipe 111 (whose ends are passed over the split bearings 113 of the plates) lying in a plane below the surface of the operating-table and the upper surfaces of the sections 107 108 being disposed substantially in the plane of such surface and forming a continuation thereof. The pipe is held rigid against any possible rotation about the bearings 113 by bringing the walls of the said bearings into forcible frictional contact with the inner walls of the pipe, such contact being effected by an expansion of the tube 113 by a screw 116 inserted into the screw-opening O″ along the line of the split, Fig. 14, said screw being operated by a detachable pocket-wrench 117, as best seen in Fig. 6. For some purposes the extension in the position as shown in Figs. 5 and 6 may be used in conjunction with the table T proper where a more extended horizontal working surface is desired; but the extension here referred to has its chief merit in its adaptability for tilting when carrying certain class of stock to be operated on. By loosening the screws 116 to permit the split walls of the tube 113 to contract the pipe 111 may be turned about its axis and the extension as a whole may be tilted to any desirable angle. One such position is shown by dotted lines in Fig. 5. If while in such inclined position the extension should be carrying a stock such as a rounded arm of a chair, it might be necessary in order to allow for a full

sweep of such arm to remove one of the sections 1 of the stock-board, and it is for this reason that the stock board or frame is made up of removable sections. The tilting extension is specially designed for holding stock such as cap-pieces for columns and the like. This stock is generally mounted on plates 118, themselves rotatable about a spindle 119, passed diametrically through the pipe 111, the upper end of each spindle terminating in a head 120, received by a corresponding socket at the center of the plate, the parts being firmly clamped by a tightening-nut 121 when once adjusted. In Figs. 5 and 6 the plates 118 are shown disposed with their diagonal dimensions in lines respectively parallel and at right angles to the front edge of the table, though they may be turned to any angle, depending on what portion of the surface of the stock mounted thereon it is desirable to operate on, Fig. 3. To turn the several plates to any angle about their axes, each spindle 119 is first loosened up slightly. Then the plate is turned about its annular supporting rib or bearing 122, when the plate may be locked by the entering of a pin or stem 123 into one of the series of holes or sockets 124 with which the said rib is provided. This pin or stem 123 is mounted in a tube or casing 125, Fig. 16, which is adapted to be inserted into an opening in the member 108 and a tubular socket 126 formed with the outer ledge 109′ of the strap 110, said casing 125 having an expanded head 127 resting in a corresponding depression formed in the member 108. The stem is encircled by an expanding spring 128, which is confined between the base of the casing and a head 129, said spring automatically forcing the stem into its proper socket 124 when the latter comes opposite thereto. When the stems 123 are not to be used, they may be retracted and held depressed below the surface of the tilting extension by the following contrivance: The base of the casing 125 terminates in a knob 130, provided with a diametrically-disposed slit 131, through which travels a cross-pin 132, carried by the stem. Upon retracting the stem the desired amount it can be given a turn so as to bring the cross-pin 132 at right angles to the slit 131, when the parts become locked in their retracted position. Upon removing the plates 118 from the extension the latter can be used as a mere extension of the operating-table proper. The stock can be secured to the plate 118 by screws 133, Fig. 5, passed through openings 134 of the plate from the bottom or, in fact, any other mechanical manner.

It is often desirable to operate on stock requiring rotation about an axis, such as balusters and the like, Figs. 7, 8. In that case the entire tilting extension is swung around to a position at right angles to the plane of the operating-table. This is accomplished as follows: Upon referring to Fig. 5 it will be seen that the securing-bolts 115 pass through the openings *o o* of the terminal-plates 114 of such tilting extension to secure the latter in a horizontal position to the operating-table. If we withdraw the left-hand or outer bolt and swing the entire extension about the inner or right-hand bolt, Fig. 5, as a center, the extension can be swung to a position at right angles to the plane of the operating-table, Fig. 7, by which time the opening *o′* of the plate 114 will be in position to receive the bolt so withdrawn, when the extension can be secured in its new position. By the time the extension has been swung to this new position the end of the rib 135, formed with the plate 114, rests against the top of the table T, so that further movement of the extension in that direction is limited. When the extension is down, the rib 135 is received by a corresponding socket 136, Fig. 8, formed in the table T. The extension when swung into the position shown in Fig. 7 constitutes the head-chuck for the stock operated on, the adjacent end of the stock being supported by mechanism as follows: The board 108 is removed and the casing 125 and parts carried thereby are removed from the socket 126 of the strap 110, and in lieu thereof there is inserted, Fig. 15, a clutch-tube 137, (allowing end adjustment of the head chuck and stock,) having an outer split end, which when properly expanded by a screw 138 frictionally engages the inner walls of the socket. The peripheral wall of the tube is provided with a screw-opening 139 for the reception of a screw 140, Fig. 7, which operates in an annular peripheral groove 141 of the spindle 142, carried by the chuck-head 143, the latter being further provided with a toothed disk 144, with the teeth of which cooperates a spring-pawl 145, which is forced into engagement with any tooth of the series by a spring 146, whose free end engages suitable notches 147, formed in the body of the pawl and in the standards 148, between which it is mounted. This arrangement permits of the free turning of the disk 144 and head 143 and the stock carried by it, the pawl being raised out of engagement for the purpose, when it can be allowed to drop into engagement with the proper tooth once the proper position of the stock has been obtained. The tail-stock 149 is of ordinary and conventional form, and I lay no claim thereto. Suffice it to say that it is secured in proper position by screw-bolts 150, passed from the under side of the stock-frame 1. The limiting-rib 135 of course brings the axis of rotation of the head 143 in line with the axis of the spindle of the tail-chuck. Where stock of the character just referred to is operated on, the strain incident to the operation thereon all comes on the bolts 115, and to remove a part of this strain under the cir-

cumstances I pass through the pipe 111 a series of tension-rods 151, the said rods being continued through bearings 152, Figs. 7, 8, formed on the hollow base of the tail-stock, the said tension-rods being secured by bolts 153, clamping the rods to the bearings, and by nuts 154, passed over the screw-threaded projecting ends of the rods. The latter can of course extend rearward to any indefinite length.

Stock, such as illustrated in Figs. 10 and 13, whose opposite ends require no carving, may be secured to the plate 118 by means of dogs 155 156, bolted thereto, the bolts being passed through holes 134′, either dog being adjustable by reason of the elongated opening 157. The dogs can be arranged with their horizontal members disposed in the same direction as shown in Fig. 10 for holding stock of the character therein shown, or they may be disposed with their horizontal members tending in opposite directions for stock shown in Fig. 13, it being understood that the vertical members 156 of the respective dogs are provided with screw-openings having axes both parallel to and inclined to such horizontal members.

It will be observed that the grooves which entered into the construction of the tool-carriage wheels and which received the cables in the patented construction are eliminated from the present construction, so as to reduce the friction between the parts as much as possible.

To such features as are old or already covered by prior patents I do not herein make reference, as these in no wise form subject-matter for claims, being well known and understood.

I do not of course desire to be limited to the precise details here shown, as they may in a measure be departed from without affecting the nature or spirit of my invention.

Having described my invention, what I claim is—

1. In a carving-machine, a suitable operating-table, a tool-carriage mounted in proximity thereto and having a motion of translation parallel therewith, a terminal section forming an extension for the table, rotatable about an axis, and susceptible of oscillation about a second parallel axis, and a track for the carriage, substantially as set forth.

2. In a carving-machine, a suitable operating-table, a tool-carriage mounted in proximity thereto and having a motion of translation parallel therewith, and an extension for said table capable of tilting and swinging respectively about two distinct parallel axes, substantially as set forth.

3. In a carving-machine, a suitable operating-table, a movable section adapted to form a continuation of the same, said section being rotatable about an axis, and susceptible of oscillation about a second axis parallel to the first axis, substantially as set forth.

4. In a carving-machine, a suitable operating-table, a movable section adapted to form a continuation of the operating-surface thereof, said section being rotatable about an axis, and having a motion of oscillation about a second axis parallel to the first axis, and means for holding the said movable section in a rigid position in a plane at right angles to the operating-surface of the table, substantially as set forth.

5. In a carving-machine, a suitable operating-table, a tilting extension therefor comprising a longitudinally-disposed pipe, terminal plates secured to the sides of the table and having split tubular bearings entering the open ends of the pipe, a series of straps clamped along the pipe and having diametrically-disposed ledges, operating boards or sections resting on and secured to said ledges, and means for expanding the split bearings to rigidly clamp the pipe thereto, substantially as set forth.

6. In a carving-machine, a suitable operating-table, a tilting extension therefor having a longitudinally-disposed pipe, terminal plates to which said pipe is rotatably secured, means for clamping the same against rotation, means for permitting the swinging of the plates along an axis adjacent to the inner edge of the extension, ribs formed on the plates for limiting the oscillation of said extension in the direction toward the table, the latter having suitable depressions for receiving said ribs when the extension has been swung to its lowest position, substantially as set forth.

7. In a carving-machine, a suitable operating-table, a tilting extension therefor comprising a longitudinally-disposed pipe, terminal plates secured to the sides of the table and having split tubular bearings adapted to be received by the open ends of the pipe, a series of straps secured along the length of the pipe and having diametrically-disposed ledges for the support of the working surfaces or boards of the extension, the outer series of ledges having tubular sockets, and means for clamping the bearings to the pipe, substantially as set forth.

8. In a carving-machine, a suitable operating-table, a tilting extension for the same, an inner and outer series of ledges disposed lengthwise in the line of the axis of rotation of the extension, and open sockets carried by the outer series of ledges, substantially as set forth.

9. In a carving-machine, a suitable operating-table, an extension therefor having a tilting and swinging movement respectively about two distinct parallel axes, a pipe carried by the table forming the axis about which said extension tilts, means for arresting the swing of the extension when in a posi-

tion at right angles to the plane of the operating-table, a tail-stock mounted on the table, and suitable tension-rods coupled to the pipe and tail-stock, substantially as set forth.

10. In a carving-machine, a suitable operating-table, an extension therefor rotatable and swinging respectively about two distinct parallel axes, the axis of rotation being located at an intermediate point between the free edge of the extension and the axis about which said extension swings, and means for arresting the extension in its swing toward the table, substantially as set forth.

11. In a carving-machine, a suitable operating-table, a tilting extension therefor adapted to be swung at an angle to the table, a socket carried by the free end of the extension, a clutch-tube adapted to be inserted into and frictionally held in said socket, and means for rotatably mounting a chuck-head in said tube, substantially as set forth.

12. In a carving-machine, a suitable operating-table, a tilting extension for the same, a tubular socket carried by the extension, a clutch-tube adapted to be inserted into and frictionally held in said socket, a chuck-head having a stem rotatably mounted in said tube, means for retaining the stem within the tube, a toothed disk carried by the head, and a spring-controlled pawl mounted on the tube for engaging and locking the toothed disk, substantially as set forth.

13. In a carving-machine, an operating-table, and an extension therefor, said extension having a motion of rotation about an axis, and an independent motion of oscillation about a second axis, substantially as set forth.

14. In a carving-machine, a suitable operating-table, a tool-carriage mounted in proximity thereto and having a motion of translation parallel therewith, belt-pulleys on said carriage, a shaft below the table adapted to oscillate vertically about a fixed center, a pulley on said shaft connected by suitable drive-belts with the belt-pulleys, a single main drive-belt for imparting motion to said oscillating shaft, and a suitable belt-tightener for said main drive-belt, substantially as set forth.

15. In a carving-machine, a suitable operating-table, a tool-carriage mounted in proximity thereto and having a motion of translation parallel therewith, belt-pulleys on said carriage, an oscillating shaft mounted below the table, a pulley on said shaft connected by suitable drive-belts with said belt-pulleys, a single main drive-belt for imparting motion to the oscillating shaft, a spring-controlled rocker-frame, and pulleys on said frame for the respective laps of the main drive-belt, the springs serving to force the frame against the belt, substantially as set forth.

16. In a carving-machine, a suitable operating-table, a tool-carriage mounted in proximity thereto and having a motion of translation parallel therewith, belt-pulleys on said carriage, an oscillating shaft mounted below the table, a pulley on said shaft connected by suitable drive-belts with said belt-pulleys, means for imparting rotation to said oscillating shaft, and suitable devices for raising the said oscillating shaft out of engagement with the drive-belts, substantially as set forth.

17. In a carving-machine, a suitable operating-table, a tool-carriage mounted in proximity thereto and having a motion of translation parallel therewith, belt-pulleys on said carriage, an oscillating shaft mounted below the table, a pulley on said shaft, belts leading from said pulley to the belt-pulleys on the carriage, means for imparting rotation to said oscillating shaft, bearings for the shaft, suitable chains or cables coupled to said bearings, guide-pulleys or sheaves for said chains, and a pedal-lever for drawing on said chains and lifting the oscillating shaft out of engagement with the belts aforesaid, substantially as set forth.

18. In a carving-machine, a suitable oscillating shaft having suitable bearings, chains or cables one end of each leading from one of the shaft-bearings, sheaves for guiding said chains, a pedal-lever coupled to the opposite ends of the chains, a notched standard passing through one end of the pedal-lever, the latter being adapted to be locked in position by the notches of the standard, substantially as set forth.

19. In a carving-machine, a suitable frame, an operating-table mounted on said frame and adjustable in a plane parallel to the operating-surface of the table, roller-bearing levers adapted to engage the under surface of the table, chains or cables leading from one of the arms of the levers, sheaves for guiding said chains, and a pedal-lever for drawing on the chains, oscillating the levers and lifting one end of the table, thereby reducing the frictional surfaces of contact during such adjustment, substantially as set forth.

20. In a carving-machine, a suitable operating-table, a tool-carriage mounted in proximity thereto and having a motion of translation parallel therewith, pulley-saddles depending from said carriage, an oscillating shaft below said carriage, belt-pulleys in said saddle and on said shaft, belts connecting the respective pulleys, and a rod depending from said saddle to insure rigidity for the saddle during the movements of the carriage, the free end of the rod operating loosely through a suitable bearing, substantially as set forth.

21. In a carving-machine, a suitable operating-table, a tool-carriage mounted in proximity thereto and having a motion of translation parallel therewith, saddles depending from said carriage, an oscillating shaft mounted below the carriage, saddles for the support of said shaft, belt-pulleys mounted in the saddle and on said shaft, belts connecting the re-

spective pulleys, and a rod rigidly connected at its upper end to the base of the adjacent saddle, the lower end of the rod playing freely through an opening in the saddle of the shaft, substantially as set forth.

22. In a carving-machine, a suitable operating-table, a tool-carriage mounted in proximity thereto and having a motion of translation parallel therewith, a saddle at each end of the carriage, a pair of pulleys mounted in each saddle, an oscillating shaft mounted below the carriage, a single belt-pulley at each end of the shaft, a pair of drive-pulleys disposed along the carriage adjacent to each saddle, a pair of superposed belts the respective laps of which pass over the pulley on the oscillating shaft, thence over the pulleys in the saddles, the inner belt passing around the first drive-pulley in the carriage located adjacent the saddle, and the outer belt passing around the second drive-pulley removed from the saddle, substantially as set forth.

23. In a carving-machine, a suitable operating-table, a tool-carriage mounted in proximity thereto and having a motion of translation parallel therewith, a saddle at each end of the carriage, a pair of pulleys mounted in each saddle, an oscillating shaft mounted below the carriage, a single belt-pulley at each end of the shaft, a pair of drive-pulleys disposed along the carriage adjacent to each saddle, a pair of superposed belts the respective laps of which pass over the pulley on the oscillating shaft, thence over the pulleys in the saddles, the inner belt passing around the nearest drive-pulley on the carriage, the outer belt being first crossed and thence passing around the second drive-pulley removed from the saddle, and an open casting or guide on the carriage for the crossed section of the outer belt, substantially as set forth.

24. In a carving-machine, a suitable operating-table, a tool-carriage mounted in proximity thereto and having a motion of translation parallel therewith, swinging arms mounted on the carriage and adapted to sweep in planes parallel, and at right angles to the operating-table, a tool-supporting bar at the free ends of said arms, tool-spindles on the bar, a pulley for each spindle, drive-pulleys mounted on the carriage and having belt connections with the pulleys on the tool-spindles, a belt-tightener for each belt mounted on the tool-carriage and comprising a frame rotatable about the axis of the pulley mounted on the carriage, a lever pivotally mounted about said axis and capable of angular adjustment relatively to the frame, a pulley carried by the frame and adapted to engage the lap of the belt, and a spring connecting the lever-arm to the adjacent swinging arm secured to the tool-carriage, substantially as set forth.

25. In a carving-machine, a suitable frame, screw-bolts located at the corners thereof, a table supported by the screw-bolts, an interiorly-threaded bevel-gear passed about the base of each screw-bolt, parallel shafts between adjacent pairs of screw-bolts, bevel-pinions on the ends of the shafts meshing with the bevel-gears aforesaid, sprocket-wheels at the adjacent ends of the shafts, chains connecting said sprockets, a sprocket-pinion mounted on the frame, and means for rotating said pinion, thereby imparting motion to the chain and actuating the screw-bolts, the latter and the table carried by them being raised or lowered according to the direction in which rotation is imparted to the pinion, substantially as set forth.

26. In a carving-machine, a suitable operating-table, a tool-carriage mounted in proximity thereto, swinging arms mounted on the carriage, a tool-supporting bar having split circular ends, rings carried by the free ends of the swinging arms and embracing the said split ends of the tool-supporting bar, the latter being susceptible of rotary adjustment within the rings, and means for spreading the split ends and frictionally forcing them into rigid connection with the inner walls of the rings, substantially as set forth.

27. In a carving-machine, a suitable operating-table, a tool-carriage mounted in proximity thereto, swinging arms mounted on the carriage, a tool-supporting bar having split circular ends terminating in conical bosses, rings carried by the free ends of the swinging arms and embracing said split ends of the tool-supporting bar, an expanding screw mounted in the split end of the bar, a jam-nut passed over the screw and having a socket to receive the boss and a head for turning the screw, the parts operating substantially as, and for the purpose set forth.

28. In a carving-machine, a tool-supporting bar, a tool-spindle mounted therein, a pulley on said spindle, one end of the pulley, having a diametrically-disposed groove formed therein, and a pin or peg carried by the bar and adapted to have its inner end inserted into the groove for purposes of holding the tool-spindle stationary, substantially as set forth.

29. In a carving-machine, a tool-supporting bar, a tool-spindle mounted therein, a casing for the spindle, a pulley on said spindle, one end of the pulley having a diametrically-disposed groove formed therein, and screws or pins projecting from the peripheral walls of the tool-spindle and resting at the bottom, and between the walls of said groove, substantially as set forth.

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

EMIL R. LOCHMAN.

Witnesses:
EMIL STAREK,
G. L. BELFRY.