(No Model.) 4 Sheets—Sheet 1.

R. MORGENEIER.

CARVING MACHINE.

No. 528,337. Patented Oct. 30, 1894.

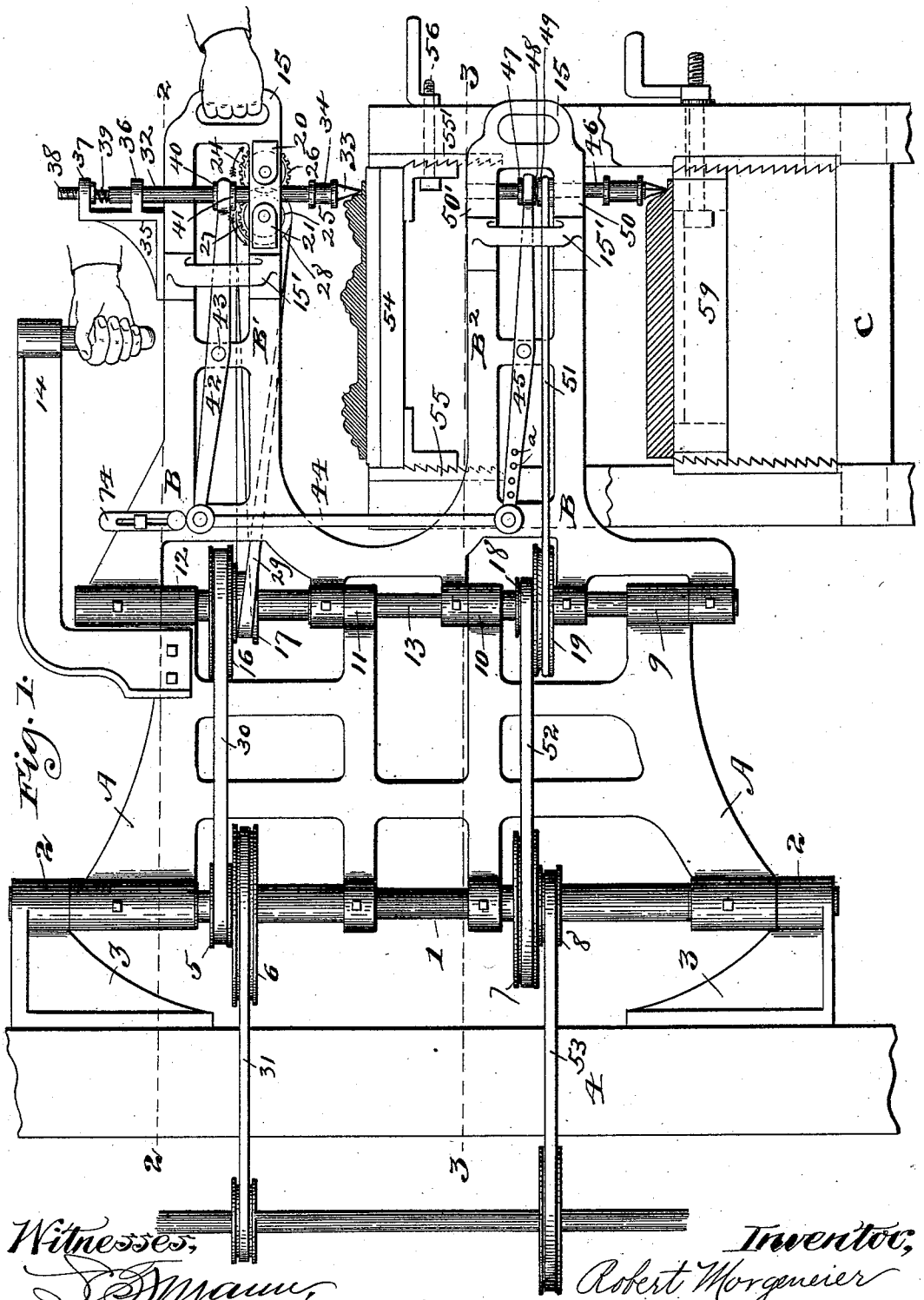

Fig. 1.

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(No Model.) 4 Sheets—Sheet 2.

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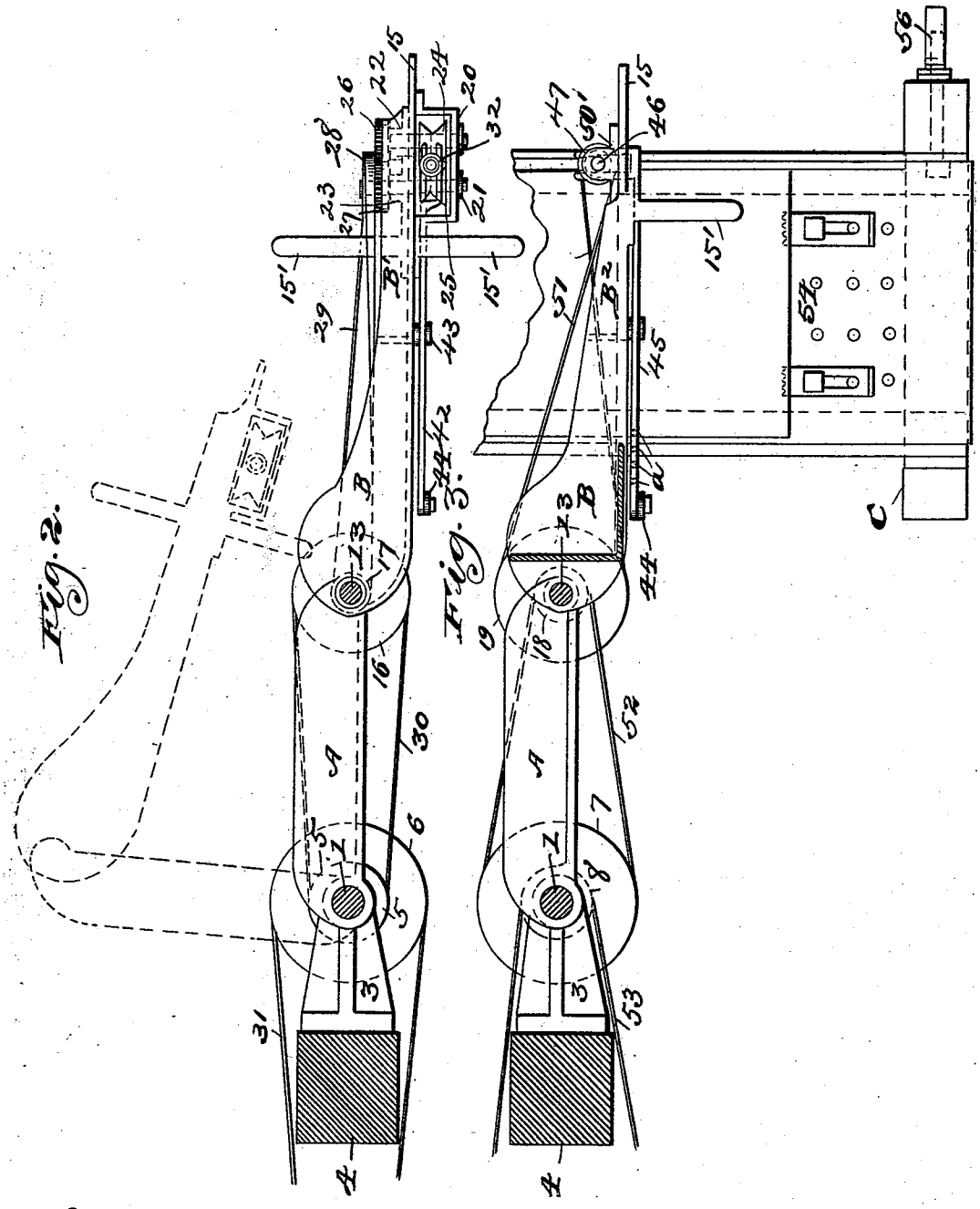

Fig. 2.

Fig. 3.

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4 Sheets—Sheet 3.

R. MORGENEIER.

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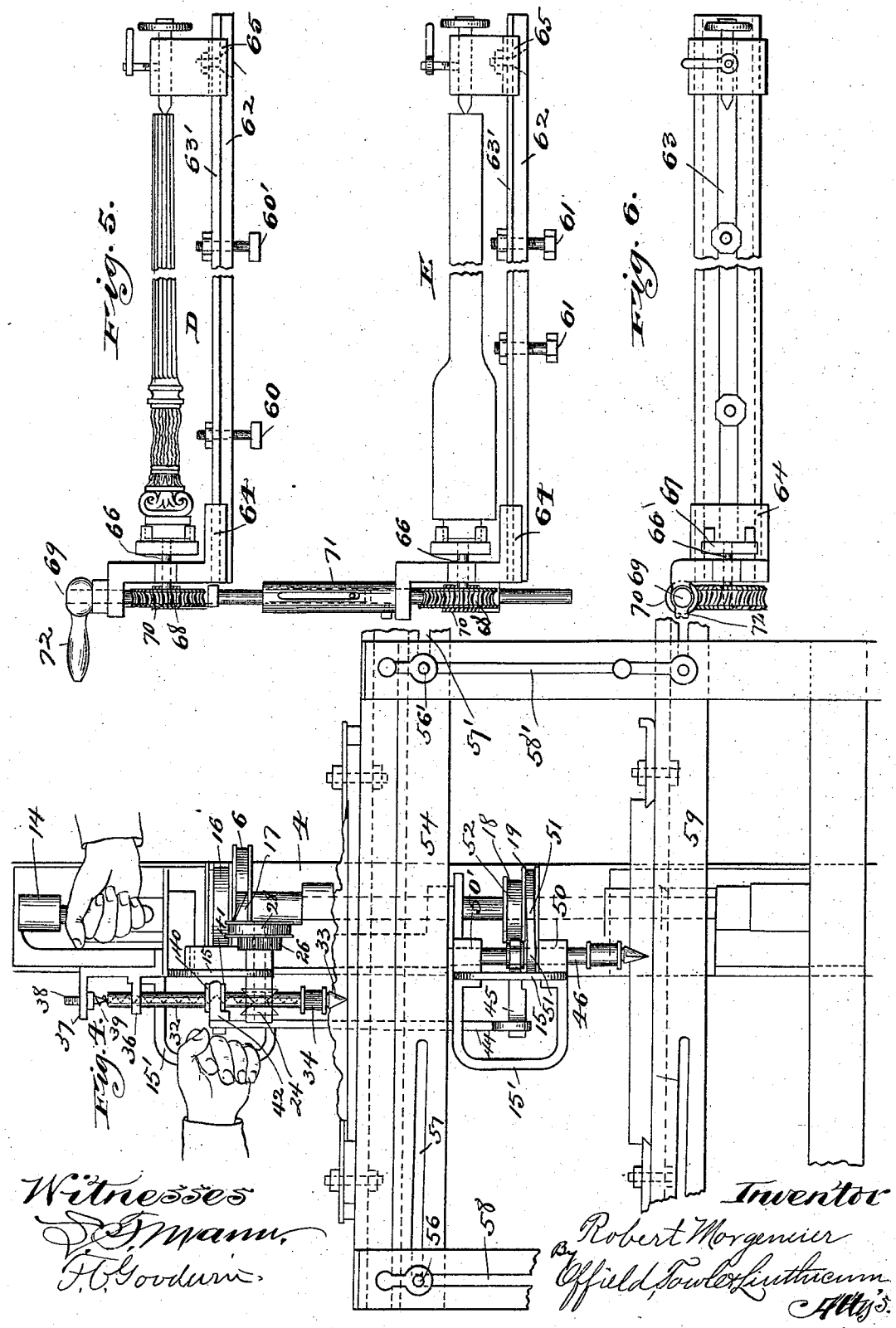

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R. MORGENEIER.

CARVING MACHINE.

No. 528,337. Patented Oct. 30, 1894.

Fig. 7.

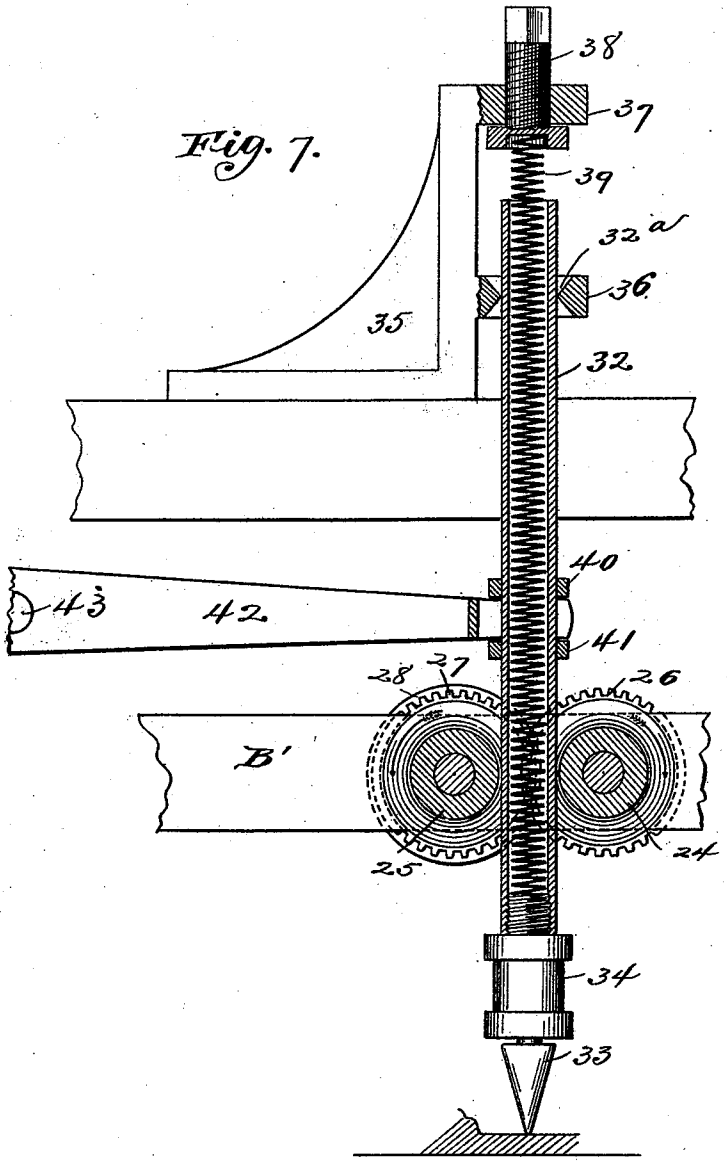
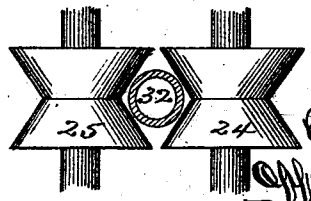


Fig. 8.



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UNITED STATES PATENT OFFICE.

ROBERT MORGENEIER, OF WINONA, MINNESOTA, ASSIGNOR TO THE AMERICAN CARVING AND MANUFACTURING COMPANY, OF SAME PLACE.

CARVING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 528,337, dated October 30, 1894.

Application filed April 1, 1893. Serial No. 468,720. (No model.)

To all whom it may concern:

Be it known that I, ROBERT MORGENEIER, of Winona, in the county of Winona and State of Minnesota, have invented certain new and useful Improvements in Carving-Machines, of which the following is a specification.

The subject of this invention is a machine to facilitate and greatly cheapen the production of carvings and sculpturings, in wood or other materials, the machine being employed in conjunction with a suitable pattern and moved thereover by hand.

To the end above named, the preferred form of construction comprises a jointed swinging frame; a reciprocal and gyratory guide-finger, connected with a reciprocal and revoluble cutter; geared traction spools and a projecting spring for moving the guide finger; a stop for limiting the movement of the guide-finger and tool; mechanism for revolving the cutter and rotating the traction spools; mechanism for holding the pattern and material and for moving or changing the position thereof when desired.

In the drawings, Figure 1 is a side elevation of the machine. Fig. 2 is a plan section on line 2—2 of Fig. 1. Fig. 3 is a plan section on line 3—3 of Fig. 1. Fig. 4 is a front view of the machine. Fig. 5 is a side elevation of a device for rotating a pattern and material. Fig. 6 is a plan view of the parts shown in Fig. 5. Fig. 7 is an elevation, partly in vertical section, of the guide finger and its controlling mechanism. Fig. 8 is a detail view of the traction rolls for imparting the gyratory movement to the guide finger.

The essence of the invention, in this construction, consists in that particular arrangement of mechanism, whereby side-guiding alone, will enable the operator to reproduce quickly and easily all the contours of an elaborate carving. Machines of this class as heretofore constructed are characterized by an arrangement of swinging arms placed one over the other, or side by side, the arrangement in all cases being such that when one of the arms is moved upward, downward or sidewise, the other arm or arms will describe the same motion. To one of these arms a rigid tracing-point is attached and to the others revolving cutters and when such a machine is put in operation the operator moves the tracing-point as well as the revolving cutters upward and downward as well as sidewise. In this manner the tracing-point will eventually touch all points of the surface of the pattern, the revolving cutter or cutters at the same time working into the material more or less, agreeable to such movement. Such arms are usually counter-poised, thus requiring additional mechanism, and throwing the momentum of the poised mass, when put into motion, upon the hands of the operator. The operation of lifting, lowering and forcing sidewise is continued until a rough duplicate of the pattern has been produced, and by the employment of cutters and tracing-points of decreasing size and repeating the above operation a duplicate of the pattern may be made, requiring very little hand finishing. The necessity of imparting all of the motions and controlling the momentum of such machines limits their cutting and proper duplicating capacity to a great extent, and damage to pattern and material often results.

I overcome the above objections and at the same time arrive at a simpler construction by making all motions excepting a side-guiding one entirely automatic. In proportion as the motions are reduced the labor of guiding the machine is also reduced.

In the drawings, A is a frame swinging on a shaft 1, the ends of which project into sockets or boxes 2, formed on brackets 3. These brackets are bolted upon a vertical beam 4. Upon the shaft 1 is loosely mounted a pulley of two steps 5, 6, and on the same shaft is also loosely mounted a pulley consisting of steps 7, 8. On the forward vertical end of piece A are formed lugs 9, 10, 11, 12, and through these pass a shaft 13. Upon the shaft 13 is rigidly held the swinging piece B, fashioned into the two horizontally projecting arms B′ B^2 with hand pieces 15, 15′. The swinging piece A is provided with a hand piece 14. On the shaft 13 are loosely mounted a pulley composed of the steps 16, 17, and a pulley composed of the steps 18, 19.

It will be seen that the pieces A and B form a jointed swinging frame, movable sidewise

only on shafts 1 and 13. By means of the hand pieces 14, 15, 15′, or by any one of them, this side motion may be readily effected.

Mounted on the side arm B′ are boxes 20, 21, 22, 23, bored to receive and carry the journaled ends of a pair of V-grooved traction-spools 24, 25. The boxes 20, 22 are adjustable so that the spools may be brought together and held at any particular position desired. Upon one end of the traction spool journals are carried a pair of spur-gears 26, 27, meshing together. A small pulley 28 is also mounted adjacent to gear 27. A belt 29 passes over the pulleys 28 and step 17 of the pulley on shaft 13. A belt 30 passes over the step 16 and step 5. A belt 31 passes over the step 6, and from thence over the pulley of a counter-shaft S. When such counter-shaft is revolved power is transmitted by the belts, pulleys and gears, just described, and causes the traction-spools 24, 25 to revolve in the direction indicated by the arrows, Fig. 1, the purpose of which will be hereinafter described.

Placed vertically between the traction spools 24, 25 is a guide finger tube 32. The spools are so adjusted that an almost insensible partial gyration of the tube may take place when a slight side pressure is exerted against a guide finger 33, held in the said tube at its lower extremity by a compression collar 34. This will be understood by reference to Figs. 7 and 8, wherein the guide finger tube 32 is shown as embraced between the grooved faces of the traction rolls. The upper end of the guide finger tube is confined between the pointed lugs 32^a, and hence is free to vibrate at its lower end at the point where the guide finger tube passes between the rolls. It is not so snugly held but that when it engages a projection upon the pattern it may yield slightly thereto, being deflected from its normal position and forced away from the face of one roll and into traction contact with the surface of either or both rolls; but immediately this occurs the roll against which it is forced being constantly rotating in a direction to lift the guide finger, a slight backward movement of such finger will result. This movement of the guide finger may be toward either of the rolls at right angles to their axes, or parallel to such axes and against the flared ends thereof, or in any direction from the normal position of the tracing point so that these movements may be and frequently are in the arcs of circles, which are more or less complete depending upon the character of the surface which the guide finger engages, but the tendency of the traction rolls is at all times to retract the guide finger while its spring constantly tends to project it. Hence I have employed the words "sensitive guide finger" and "gyratory guide finger" as describing these movements.

Formed on the arm B′ is a bracket 35, and formed on the bracket 35 is a lug 36 directly over the center of the finger-tube 32. Through a snug fitting bore hole in the lug 36 passes the tube 32 as shown. Centrally over the lug 36 is a lug 37 carrying an adjusting bolt 38, the downwardly projecting head of which is counter-sunk to receive and hold the end of a spiral spring 39, which spring passes into the tube 32 and is seated at its lower end upon a fixed plug in the lower part of such finger-tube. The spring 39 is thus compressed between the bolt and the plug in the finger tube 32. The office of the spring is to project the finger-tube and finger downward and the proper pressure is attained by means of the adjusting bolt 38. On the finger-tube 32 are formed two collars 40, 41, and between these the bifurcated end of a lever 42 is held. The lever 42 is pinioned at its center longitudinally upon the arm B′ by a pivot bolt 43. An adjustable limit lug or stop 74 held on the arm B′ immediately over the rear end of the lever 42 controls the distance to which such lever end may rise. The rear end of the lever 42 is pivotally connected by a rod 44 with a lever 45, which is pivoted between its ends to the arm B^2. A cutter spindle 46 having rigid collars 47, 48 and a rigid pulley 49 mounted thereon is held vertically in boxes 50, 50′, which boxes are mounted upon the side of the arm B^2, as shown. The forward end of the lever 45 is bifurcated and its bifurcations pass snugly between the collars 47, 48. In the lever 45 are bore holes *a*, *a*, *a*, *a*.

From the above description it is obvious that if the guide finger 33 and the tube 32 holding it be raised or lowered, the cutter and spindle 46 will describe the same motion and that, on the other hand, if the rod 44 be connected with the lever 45, at one or the other of the holes *a*, *a*, *a*, *a*, the cutter spindle will be raised proportionately higher or lower than the finger tube, the object of which will be hereinafter explained.

A belt 51 passes over the small cutter-spindle-pulley 49 and step 19. A belt 52 passes over the steps 18, 7, and a belt 53 passes from a counter-shaft pulley over the step 8. When the counter-shaft is revolved power is transmitted by means of the belts and pulleys and the cutter spindle is rotated at high speed.

C, Figs. 1, 3 and 4, is a table frame, placed in the position shown in Fig. 1. At its upper end a vertically and longitudinally adjustable pattern holding table 54, (movable longitudidinally in rack ways 55, 55′) is rigidly held at any desired altitude or length by means of clamping bolts 56, 56′. The slots 57, 57′ in the table allow the same to be moved lengthwise and the slots 58, 58′ in the corner posts of the frame C provide room for the bolts 56, 56′ when the table is placed higher or lower in the rack ways.

Under the pattern table 54 is a material holding table 59, constructed movable and adjustable in the same manner as table 54.

Figs. 5 and 6 illustrate detachable table devices for holding patterns and materials

whereon more than one side is to be acted upon by the machine. The devices consist of a part D which when in use is clamped by means of the bolts 60, 60′ upon the table top 54, and a part E clamped in the same way upon the lower table 59 and vertically under the device D. The parts D and E each consist of a bed 62 provided with side flanges 63′ and a longitudinal slot 63 formed in its center. A head stock 64 is rigidly mounted upon and at one end of the bed, and a tail stock 65 which is guided by the flanges slides on the bed, and can be fastened at any point thereon, by a clamping bolt. The head stock 64 carries a shaft 66. Mounted on shaft 66 is a chuck 67 and at the opposite and outer end a worm wheel 68. A vertical shaft 69 held in boxes formed in lugs of the head stock carries a worm or screw 70, which engages the worm wheel 68. Shaft 69 has a telescopic joint 71 whereby it is connected to the shaft, worm wheel and screw of the material holding device E. When the devices D and E are bolted upon their tables and the shaft 69 is turned by means of the handle 72 the pattern and the material held in such devices will move correspondingly.

When the belts of the machine are set in motion, the traction spools 20, 21 will revolve in the direction of the arrows and the cutter 73 will revolve at high speed. When the hand pieces 14, 15 are grasped, the frames A, B may be moved so that the guide finger 33 and the cutter 73 will describe curves from right to left or vice versa, or the guide finger and the cutter may be caused to move regularly or irregularly in all horizontal directions. Now if a pattern and material have been placed as shown in Fig. 1, and the guide finger and cutter are advanced against these respectively, the cutter will remove the material encountered to a depth regulated by the previous adjustment of the limit lug or step 74. Immediately however when the guide finger is slightly pressed against an elevation of a pattern its almost insensible partial gyration will establish traction contact with one or both of the spools 21, 22, whereby the finger will be lifted upward, and the cutter describe the same motion. The downward pressure of the spring and the upward traction motion will be perfectly balanced, so that the finger will guide upward and downward over undulations upon the slightest pressure and instantly rise to the height of a rectangular projection when the finger encounters such, and increasing pressure causes an increase of traction power by reason of increased contact.

When a depression in the design occurs traction contact between the spools and finger tubes ceases, whereupon the spring 39 immediately projects the finger and cutter downward. With ordinary care it is impossible to injure the pattern or tear away parts of the material and even should the guide finger be advanced quicker than the capacity of its cutter, both will rise upward and away from the work.

With the machine, pattern and material in position as shown in Fig. 1, one manner of operating is as follows: I move the guide finger and cutter to one corner of the pattern and material. Now with the hand piece 15 I cause the guide finger and cutter to sweep in constantly increasing radii to the right and left diagonally across the face of the work, at the same time moving the arms back by means of the hand piece 14. The guide finger and cutter will reciprocate automatically and agreeable to the elevations and depressions of the pattern. After thus passing over the surface, a fair duplicate will result. I then employ a smaller guide finger and cutter, following the outline until the duplicate has all the detail and finish required.

When it is desired that the duplicate shall be cut deeper than the pattern, I vary the connection of the rod 44 to the lever 45 by means of one of the perforations *a*, *a*, *a*, *a*. When a spindle, or other pattern, requiring cutting upon more than one side, is to be duplicated I employ the devices shown in Figs. 5 and 6, revolving the pattern and the material step by step during the process of duplication. Such rotation, after a part of the surface has been worked upon, I effect by turning the hand piece 72.

In the foregoing I have described a machine provided with a single guide finger and cutter held in arms arranged one over the other; but I desire it understood that I do not confine myself to the use of a single guide finger or cutter or a single pair of arms carrying the same. One guide finger and a number of arms and cutters arranged one over the other may be employed, or I may place a number of arms and cutters in the same plane and at one or both sides of the guide finger, properly connecting such finger so that it will control the cutters. The same may be said in reference to the number or position of the tables, or the number and positions of the holding devices thereon. Instead of a cutter, technically so-called, I may employ any tool whereby the contours of any pattern may be reproduced in the material.

What I claim as new, and desire to secure by Letters Patent, is—

1. In a carving machine, the combination with a frame mounted and confined to swing in a uniform plane about a fixed axis, of a connected guide-finger and tool mounted on the frame substantially parallel to its axis, the guide-finger being normally yieldingly held in contact with the pattern and capable of automatic reciprocation whereby to control the reciprocation of the cutter, substantially as described.

2. In a carving machine, the combination with a frame mounted and confined to swing in a uniform plane about a fixed axis, of a connected guide-finger and tool mounted on the frame substantially parallel to the axis

thereof and capable of automatic reciprocation with reference thereto, the guide-finger being normally yieldingly held in contact with the pattern and capable of yielding to side pressure, and means for retracting the guide-finger upon such lateral pressure, substantially as described.

3. In a carving machine, the combination with a frame mounted and confined to swing in a uniform plane about a fixed axis, of a connected guide-finger and tool mounted on the frame substantially parallel to the axis thereof, the guide-finger being normally yieldingly held in contact with the pattern and capable of lateral movement, and means for retracting the guide-finger and thereby reciprocating the tool with reference to the frame, substantially as described.

4. In a carving machine, the combination with swinging frame, of an independently reciprocal and gyratory guide finger carried by said frame, and a reciprocal tool connected with and reciprocated by the guide finger, substantially as described.

5. In a carving machine, the combination with swinging frames, of a gyratory and reciprocal guide finger carried by said frames and a revoluble and reciprocal tool also carried by said frames and reciprocated by the agency of the guide finger, substantially as described.

6. In a carving machine, the combination with swinging frames, of a reciprocal and gyratory guide finger and means for projecting and retracting said finger, substantially as described.

7. In a carving machine, the combination with swinging frames and a reciprocal and gyratory guide finger, of means for projecting and retracting such finger, a reciprocal and revoluble tool and a connection between said guide finger and tool whereby a reciprocal motion of the finger may be communicated to the tool, substantially as described.

8. In a carving machine, the combination with swinging frames, of a reciprocal and gyratory guide finger and a reciprocal and revoluble cutter carried on such frames, and an adjustable connection between such finger and tool, substantially as described.

9. In a carving machine, the combination with swinging frames, of a reciprocal and gyratory guide finger and a reciprocal and revoluble cutter carried by such frames, an adjustable connection between such finger and tool, and an adjustable stop on such frames whereby the reciprocation of such finger and tool may be limited, substantially as described.

10. In a carving machine, the combination with swinging frames, of grooved and geared traction spools mounted in bearings thereon, and a guide finger tube arranged between such spools, substantially as described.

11. In a carving machine, the combination with a frame mounted and confined to swing in a uniform plane about a fixed axis, of a connected guide-finger and tool mounted thereon substantially parallel to the axis thereof and capable of automatic reciprocation with reference thereto, the guide-finger being normally yieldingly held in contact with the pattern and controlling by its reciprocation the reciprocations of the cutter, and an adjustable stop for regulating the range of the reciprocating movement, substantially as described.

12. In a carving machine, the combination with a frame mounted and confined to swing in a uniform plane about a fixed axis of a guide-finger and tool mounted thereon substantially parallel to the axis thereof and capable of automatic reciprocation with reference thereto, the guide-finger being normally yieldingly held in contact with the pattern, and a variable connection between the guide-finger and tool whereby the depth of cut of the tool may be varied, substantially as and for the purpose described.

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