

No. 757,230.

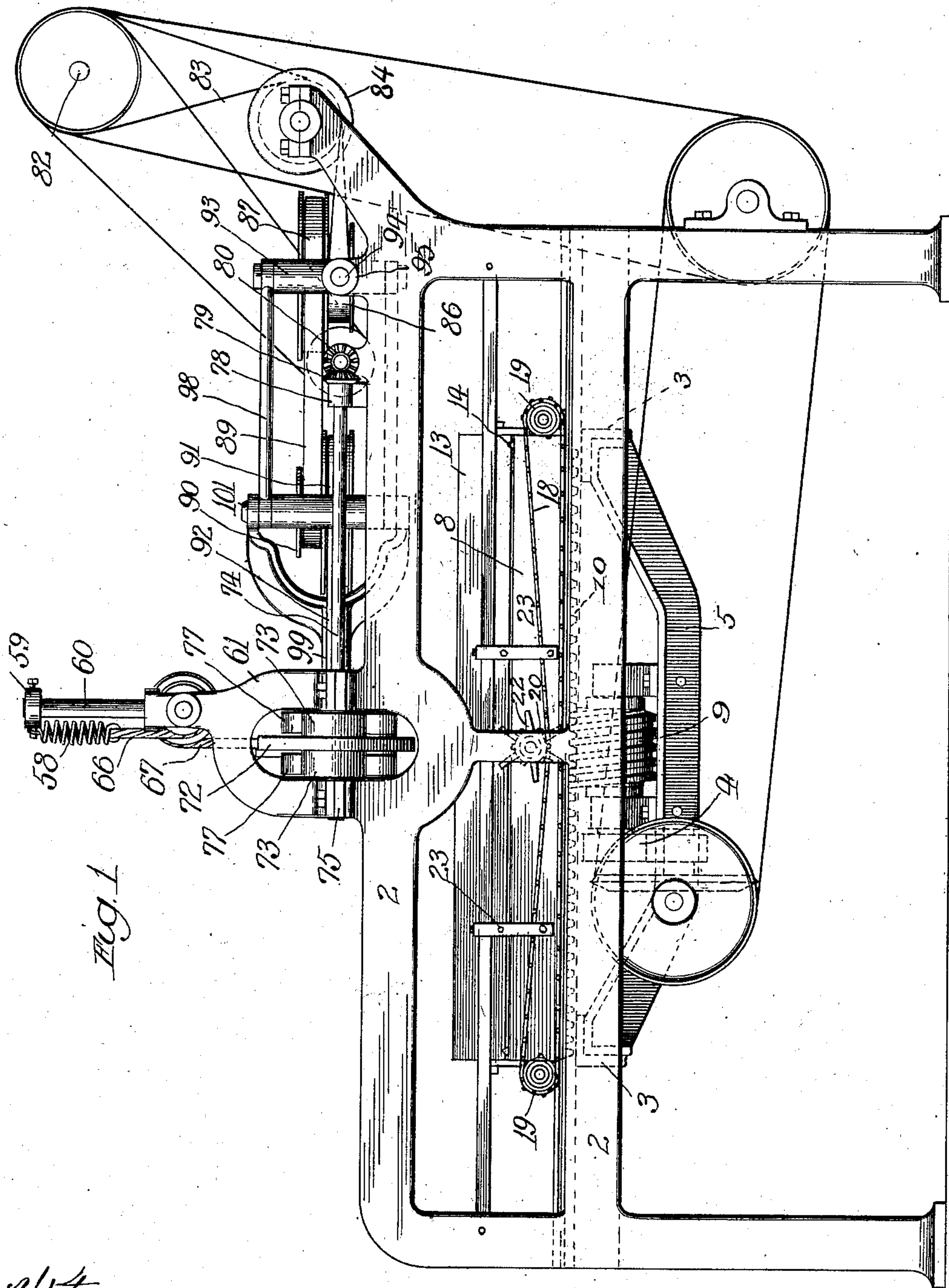
PATENTED APR. 12, 1904.

C. L. RUEHS & F. STREICH.
AUTOMATIC CARVING MACHINE.

APPLICATION FILED NOV. 26, 1902.

NO MODEL.

5 SHEETS—SHEET 1.



Witnesses
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E. Ireland

Inventor's:
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6 SHEETS—SHEET 2.

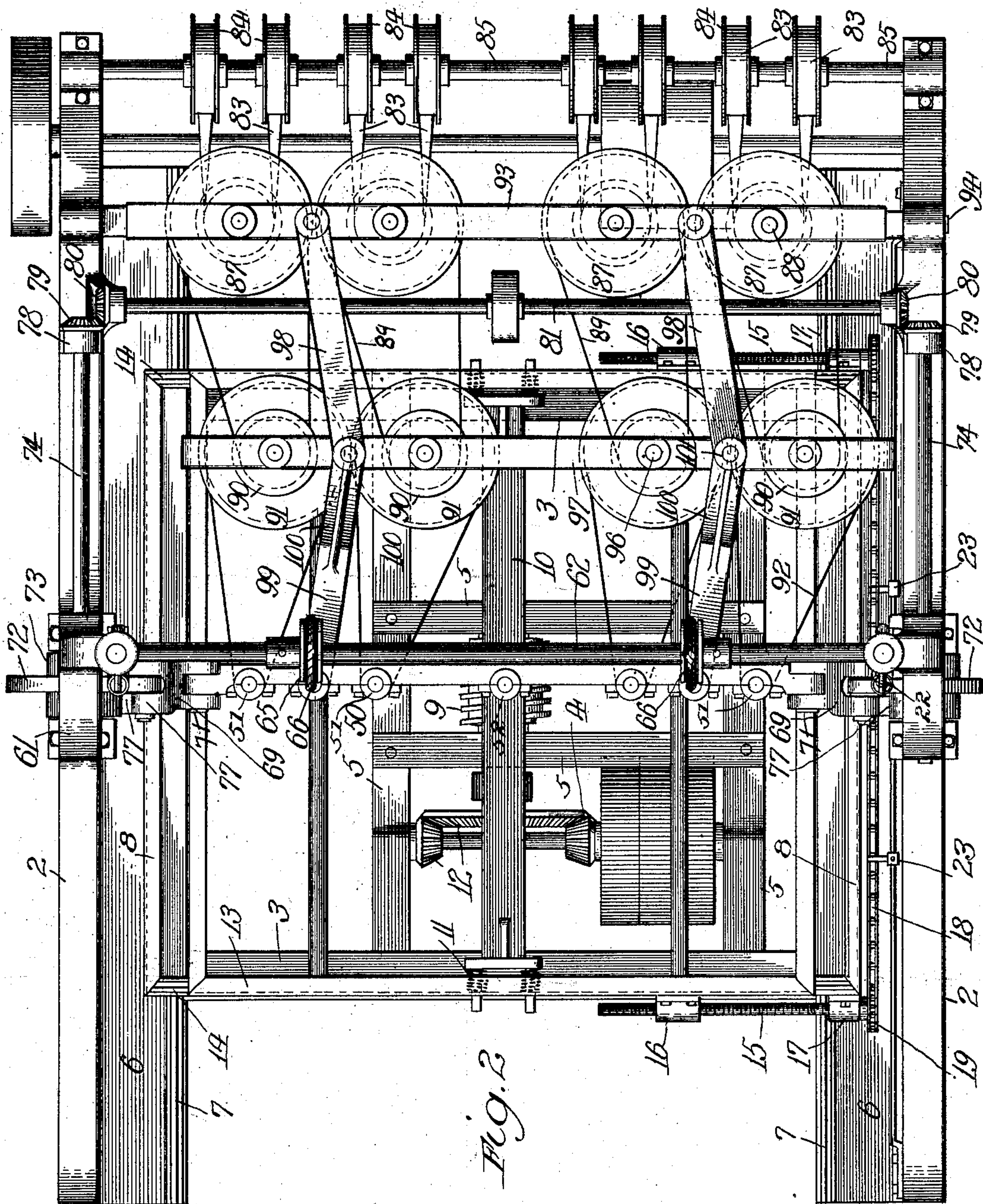


Fig. 2

Witnesses:

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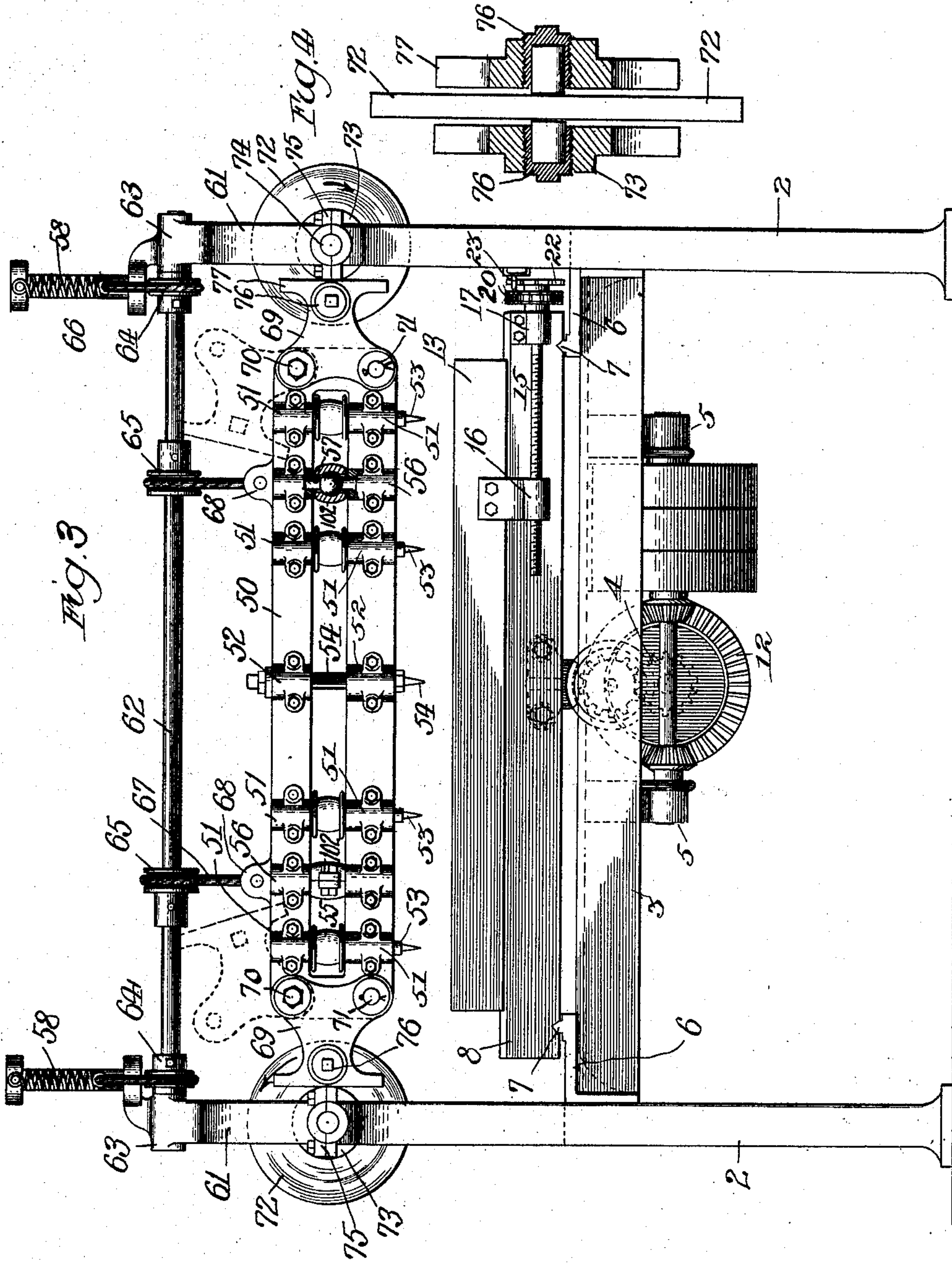
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5 SHEETS—SHEET 3.



Witnesses:
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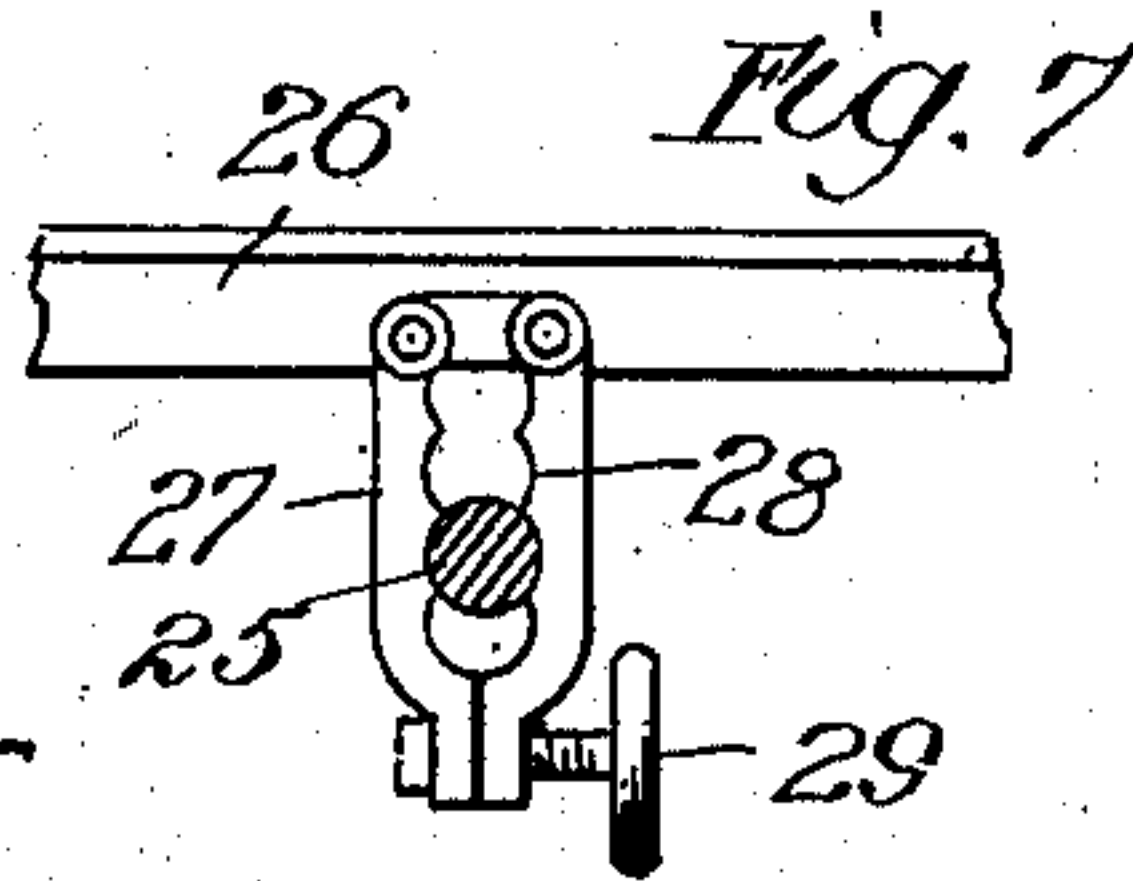
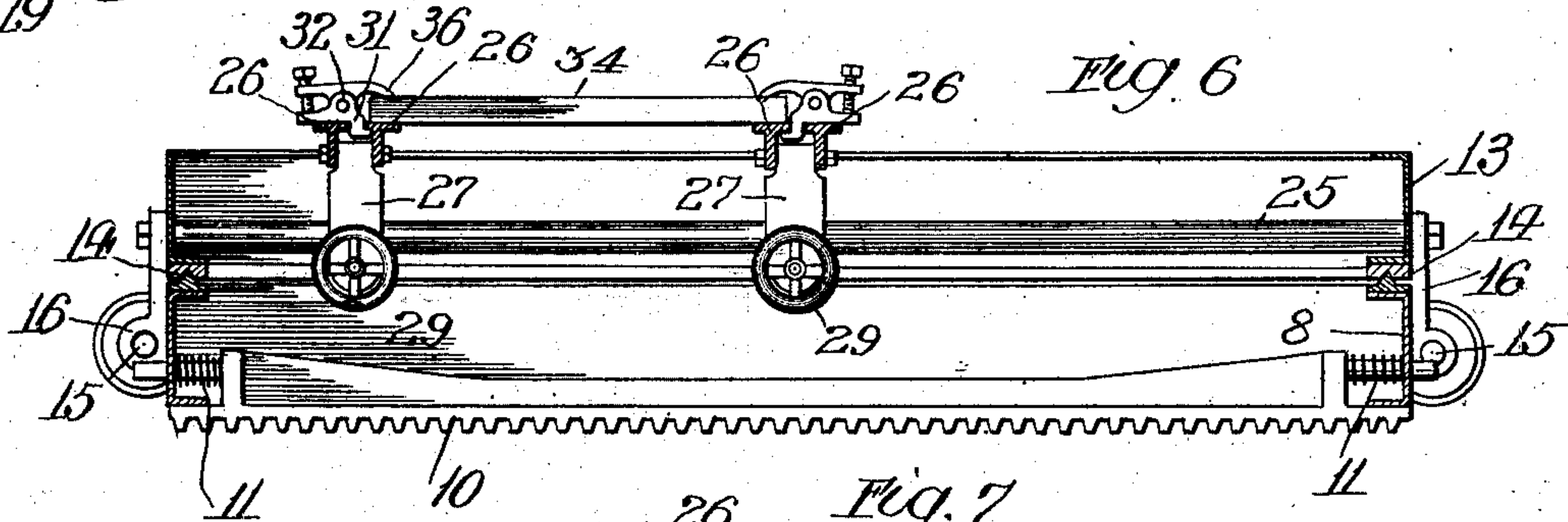
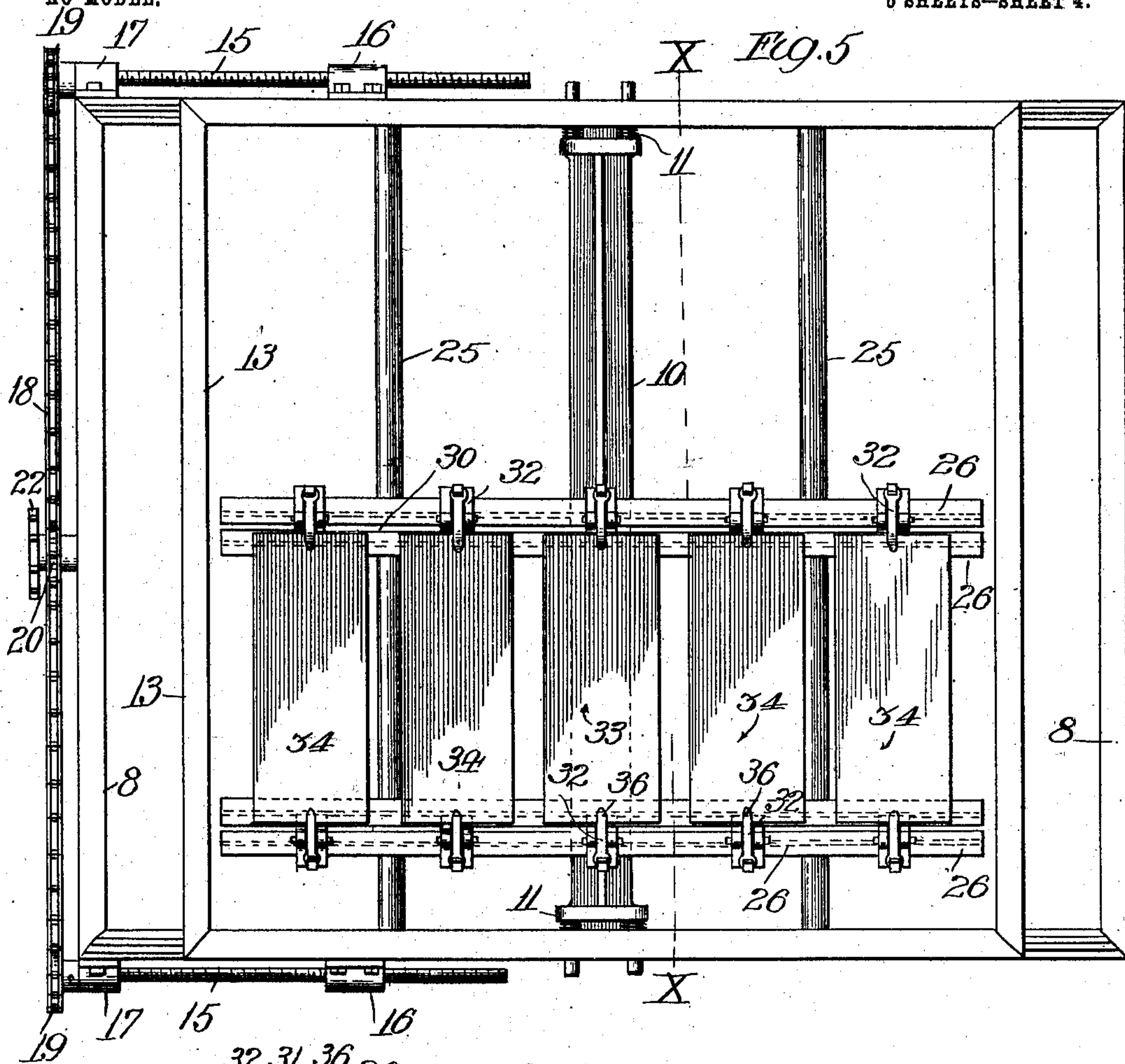
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5 SHEETS—SHEET 4.



Witnesses:
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No. 757,230.

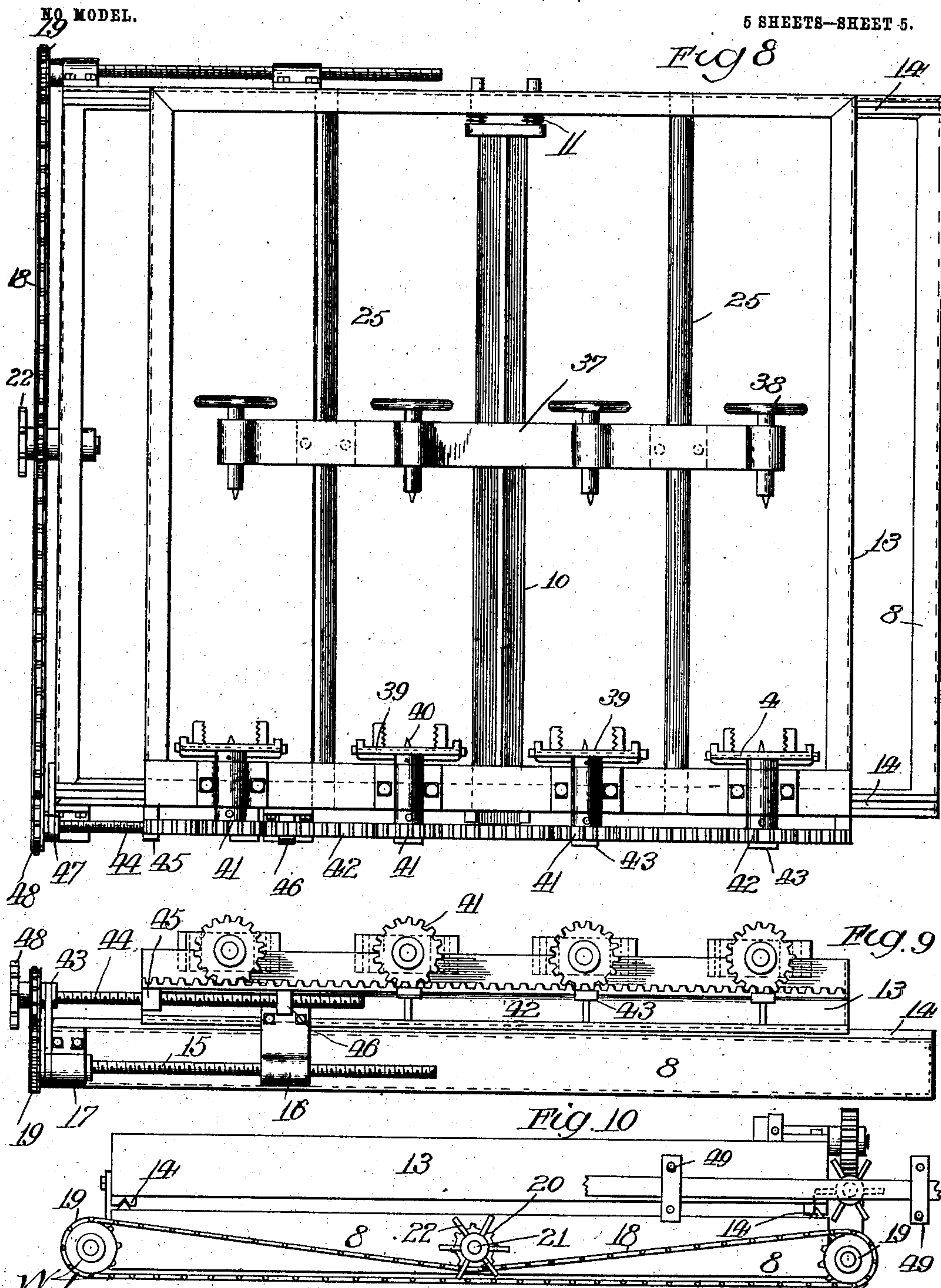
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NO MODEL.

5 SHEETS—SHEET 5.



Witnesses:
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By *C. Hawley* Attys

UNITED STATES PATENT OFFICE.

CHARLES L. RUEHS AND FRANK STREICH, OF CHICAGO, ILLINOIS, ASSIGNORS TO UNIVERSAL AUTOMATIC CARVING MACHINE COMPANY, A CORPORATION OF NEW JERSEY.

AUTOMATIC CARVING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 757,230, dated April 12, 1904.

Application filed November 26, 1902. Serial No. 132,902. (No model.)

To all whom it may concern:

Be it known that we, CHARLES L. RUEHS and FRANK STREICH, citizens of the United States, residing at Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Automatic Carving-Machines, of which the following is a specification.

Our invention relates to carving-machines, and particularly to automatic carving-machines which after proper adjustment are adapted to operate automatically and accurately reproduce a complete relief or intaglio pattern. Such machines generally comprise a reciprocating feed-table for the pattern and work and for which suitable means of actuation are provided, in combination with a tool-head that is fixed above said table and is provided with a plurality of high-speed cutter-spindles and a pattern-tracer movable therein and a tracer-retracting mechanism that is driven continuously to automatically retract the tracer and the cutters whenever the tracer encounters an upward incline or projection upon the pattern. Automatic machines of this general type operate rapidly and the work turned out thereby, while faithfully representing the main lines, curves, and figures of the pattern, does not present the fine, sharp, clean-cut angles and curves of the pattern, and hence it is necessary to finish the work or panels by hand or by means of a hand-operated carving-machine in which smaller or finer tools may be used. The latter method is not generally practiced because of the expense sustained and the time that is wasted in accurately placing the panels taken from the automatic machine upon the table or tables of the hand carving-machine.

The object of our invention is to improve the construction and operation of automatic carving-machines with special view to rendering the retracting mechanism thereof more delicate, sensitive, and powerful.

The particular object of our invention is to provide a combined automatic and hand carving machine—that is, a machine which will automatically reproduce the pattern in the

rough and which may thereafter without disturbing the work or panels be employed or controlled by hand for the finishing of the work.

With these ends in view our invention consists generally in a carving-machine of the construction and combination of parts hereinafter described, and particularly pointed out in the claims.

The invention will be more readily understood by reference to the accompanying drawings, forming a part of this specification, and in which—

Figure 1 is a side elevation of a combined automatic and hand-controlled carving-machine embodying our invention. Fig. 2 is a plan view thereof with the work and pattern clamping means removed from the table. Fig. 3 is an end view of the machine. Fig. 4 is an enlarged sectional detail of one of the retracting devices. Fig. 5 is a plan view of the feed-table. Fig. 6 is a sectional view on the line *x x* of Fig. 5. Fig. 7 is a detail of a work-elevating device. Fig. 8 shows the feed-table equipped for rotary carving. Fig. 9 is an end view taken from Fig. 8, and Fig. 10 is a side view of the table.

As shown in the drawings, 2 2 represent the side frames of the machine. These are joined by two or more cross-beams 3 3, which carry the table-driving mechanism 4, that is arranged in the frame 5, which hangs from the cross-beams 3 3. On the inner sides of the frame 2 2 are parallel horizontal frame-pieces 6 6, provided with V-ribs 7, on which the bed 8 of the feed-table is reciprocated by the driving mechanism. The driving connection with the table comprises the worm 9, that meshes with the worm-rack 10, that is arranged midway of the bed 8, cushion-springs 11 being interposed between the rack and the ends of the bed for the purpose that is fully described in the application of Frank Streich, said application being Serial No. 104,445, filed April 24, 1902. The rotation of the worm 9 is controlled through the medium of the motion-reversing gears 12, that are brought into play by the belt-shifting mechanism, which is

actuated by the movement of the bed, whereby the stroke of the bed is regulably fixed and limited according to the length of the pattern to be produced.

5 The bed 8 carries the work and pattern feeding table 13, slidable upon the ways 14, provided on the bed 8, and by which the pattern and work are moved transversely of the machine. For moving or feeding the table
10 transversely we use the screw-spindles 15 at opposite ends thereof and operating through threaded boxes 16, provided on the table 13.

The outer ends of the spindles 15 are held in the journal-boxes 17 on the bed 8, and the
15 spindles 15 are driven by a sprocket-belt 18, which runs over sprockets 19, provided on the ends of the spindles 15. The upper stretch of the belt 18 runs beneath a sprocket 20, that is arranged on a stud 21, extending from the
20 end of the bed 8. The star-wheel 22 is attached to the sprocket 20, and this is operated intermittently by the pins or dogs 23 23 in the adjustable blocks 24, these blocks being stationary, while the bed is movable. In this
25 manner the belt and the screw-spindles are rotated by the reciprocation of the table. When the table has been moved the full distance in one direction, the pins 23 are changed into the other holes in the blocks to reverse the
30 rotation of the star-wheel and belt.

The table 13 is provided with two or more longitudinal rods or bars 25, on which the work-supporting clamps are arranged. The main members of the clamps are two pairs of
35 "T-bars" 26 26, extending transversely across the bed and table. The T-bars of each pair are separated by occasional blocks and by the upper ends of the elevating-clamps 27, two of which are provided for each rod 25. These
40 last clamps or jaws 27 are pivoted at their upper ends and have scalloped inner sides 28 to engage the rods 25, being fastened thereto by pressure from the hand-screws 29. The slots 30 between the T-bars are occupied by
45 the hooked lower ends 31 of the shiftable screw-clamps 32, by which the pattern 33 and the work-panels 34 are secured upon the tops of the bars. The work-clamps are broad at the base and are provided with sharp fingers
50 36 to sink into and securely hold the wooden panels. They possess the advantage of being low and when thick panels are used lie entirely beneath the surfaces thereof, so that there is little danger of their being struck by
55 the tools.

When work of a cylindrical character is to be produced, the panel-clamps are removed from the table and the chucks and centers shown in Figs. 8 and 9 are used.

60 37 represents a bar that is slidable on the rods 25 and is adapted to be fixed thereon. This bar contains a plurality of tailpieces or centers. Opposite these are the chucks 39, having adjustable jaws and each provided with
65 a center 40. The short shafts of the chucks

are held in bearings on the end of the table and have gear-pinions 41 on their outer ends, all of which mesh with the rack 42. The rack is slidable in the bearings 43 on the end of the table and is operated by means of the screw-
70 spindle 44.

45 is the spindle connection to the rack, and 46 and 47 are journals provided, respectively, upon the table and the bed. If it is desired to shift the table transversely and at the same
75 time rotate the chucks, the sprocket-belt may be extended around the sprocket on the spindle 44; but for this purpose and for operating the rack and chucks when the table does not move on the bed we prefer to employ a
80 star-wheel 48 on spindle 44, for which operating-dogs 49 49 are provided in the side frame of the machine.

The chief novel features of our invention are found in the tracing and cutting mechanism, which will now be described. Our machine is provided with a pendent tool-head, that is adapted for vertical movement during the automatic operation of the machine and which is also adapted for various lateral move-
90 ments and inclinations when the machine is being used in hand-finishing the work that has been automatically carved. The floating or pendent tool-head may be of any acceptable design; but we prefer that it shall com-
95 prise the light rectangular frame 50, provided with a plurality of pairs of cutter-spindle journals 51 and a pair of bearings 52, containing the cutter-spindles 53 and the tracer 54, respectively. The cutter-spindles are pro-
100 vided with ball-surface belt-pulleys 55 between the top and bottom rails of the frame 50. The middle portion of the tracer 54 is exposed in the opening of the frame to be grasped by the hand of the operator, and the tracer is
105 vertically adjustable in the frame 50. Near its ends the frame 50 is provided with other clamp bearings or boxes 56, containing short shafts that are provided with ball-surfaces 57 in the open space between the top and bottom
110 rails of the frame, the uses of which will be hereinafter described.

The tool-head is supported by the springs 58, the strength of which is sufficient to nearly counterbalance the weight of the frame and the parts carried thereon and connected there-
115 with. The upper ends of the springs are attached to the adjustable collars 59 on the upper ends of the standards 60, provided on the upper portion 61 of the side frames 2.

62 is a shaft journaled in bearings 63 and carrying the small cord or cable pulleys 64 64 and the larger cable-pulleys 65 65. Cables 66 are attached to the pulleys or wheels 64, wound thereon, and attached to the lower ends
120 of the springs 58, while the cables 67 are oppositely wound and attached to the pulleys 65 and have their lower ends fastened to the lugs 68 on the top of the frame 50. A short rotative movement imparted to the pulleys 65 by
125

vertical movement of the frame 50 will produce a still shorter movement upon the pulleys 64 and the springs 58. We are thus enabled to employ short strong quick-acting springs 58 in place of the long slow-acting springs hitherto employed in spring-counter-balanced carving-machines. In addition to this advantage we attain a distinctly meritorious feature in the flexible attachment and suspension of the tool-head within the machine-frame.

The frame 50 is provided at each end with a block 69, that is pivoted by a bolt 70 therein, by which bolt and the removable pin 71 the block is rigidly secured to the frame, though upon removal of the pins 71 both blocks may be turned upwardly into the positions shown by dotted lines in Fig. 3. The blocks are bifurcated to receive the disks 72. These disks have the large hubs 73 and are arranged on opposite sides of the machine upon the shafts 74, that have bearings 75 formed in the two parts 2 and 61 of each side frame. The bifurcations of the blocks 69 are provided with adjustable friction-buttons 76, which continuously bear against opposite sides of the disks. The blocks are also provided with the vertical portions 77, that bear upon the hubs 73 of the disks, guiding the frame vertically and holding the same against longitudinal movement between the disks. The shafts 74 extend rearwardly to bearings 78 and are there provided with the beveled gears 79, that mesh with the beveled gears 80 upon opposite ends of the cross-shaft 81, by which the disks are driven in opposite directions, the inner sides of the disks turning or revolving upwardly, as indicated by arrows in Fig. 3. The shaft 81 is driven from the counter-shaft 82, arranged above the machine. These parts—to wit, the bifurcated blocks, with their buttons 76 and the disks 72—together constitute the automatic retracting mechanism of the machine, the force of which is most advantageously applied at the ends of the tool-head and the construction being such as to render unnecessary other guides for the frame.

The cutter-spindles are driven at a high speed from the counter-shaft 82. The connection is as follows: In each case a belt 83 extends from the pulley on the counter-shaft 82 downward and around an idler-pulley 84 on the shaft 85, thence around a small pulley 86, thence back to the mate 84 of the first idler, and thence returns to the counter-shaft pulley. The pulley 86 is mated with a larger pulley 87, and therewith is journaled upon a short shaft 88, that is at right angles to the shaft 85. The belt 89 extends from the pulley 87 to a smaller one 90, which is mated with a larger pulley 91, from which a belt 92 extends to the small pulley upon the cutter-spindle in the tool-head. The shafts 88 extend transversely of the rectangular frame 93, that is provided on its ends with gudgeons 94, which are journaled

in bearings 95, provided therefor on the side frames 2. The shafts 96 of the pairs of pulleys 90 91 extend transversely of and are journaled in the rectangular frame 97, that is joined to the frame 93 by parallel links or jointed arms 98, whereby the frame 97 is at all times held parallel with the frame 93. For also holding the tool head or frame 50 parallel with the frame 93 we employ the links or jointed arms 99, having yokes 100 upon their rear ends which are pivoted upon the same pins 101 that are used for pivoting the links 98 to the frame 97. The forward ends of the links or arms 99 are provided with ball sockets or journals 102, whereby the same are universally pivoted or joined to the balls 57 and the tool-head. It is evident that as the tool-head rises and falls in operation the whole structure will swing upon the gudgeons 94, and it is further obvious that whatever the movements of the tool-head may be the distances between the centers of the belt-pulleys will not be changed. It is further obvious that when the blocks 69 are removed from the tool-head 50 or are turned into the dotted-line positions, thereby disconnecting them from the disks, the tool-head may be moved back and forth in the main frame of the machine at will and will be held parallel with the pulley-frame 93 by the parallel motion interposed between said parts, and the tool-head may at the same time be lifted or depressed or may be thrown out of its normal vertical position into any of the forwardly or rearwardly inclined positions necessary for "undercutting," thus making it possible to manipulate the tool-head by hand and quickly and nicely finish all of the panels previously roughed out by the machine in automatic action. The universal movements to which the tool-head is adapted are directly attributable to the ball-and-socket connections between the tool-head and the parallel-motion members and to the arrangement of said ball-and-socket connections in the plane of the series of belts which operate the cutter-spindles.

The retracting mechanism and the relation thereof to the tracer and cutters, while resembling the mechanism shown in Letters Patent granted to us March 25, 1902, No. 696,382, differs therefrom in several essential particulars, to wit: The tracer and the cutter spindles are here joined in a single rigid tool-head instead of being held separately as before. This insures the absolute and simultaneous movement of the tracer and the tools one with the other and there is no chance for one to lag with respect to the other. Again, a large proportion of the detrimental friction noticeable in our former machine, due to the great number of parts having slide-bearings; is here avoided by making the retracting-mechanism members at once the guides of and operators for the connected tracer and tools. Again, whereas it was nec-

essary in our former machine to depend upon the friction generated in the retracting mechanism by the positive lateral pressure of the pattern against the tracer-point, we here supplement the pressure upon the tracer by the cramping of the friction-buttons upon the friction-disks. In other words, when the tracer-point is struck by a projection in the pattern the pressure thereon tends to turn or rotate the tool-head upon a horizontal axis, and thus cramps the disks between the opposed friction-buttons to supplement the normal frictional engagement between the parts. The result is that the retracting mechanism here shown is far more sensitive and powerful than before and operates with less pressure between the pattern and tracer. It will be evident also that when the tracer-point of our machine is engaged by a portion of the pattern that presents an angle in a horizontal plane there will be a tendency to longitudinal movement of the tool-head. This will result in pressing the end guides 77 against the hubs of one of the friction-disks, which will assist in lifting the head. At the same time one end of the tool-head cannot move upwardly more rapidly than the other because of the parallel-movement connection—to wit, the shaft 62 and other parts—between the head and the lifting-springs.

As numerous modifications of our invention will readily suggest themselves to one skilled in the art, we do not confine the invention to the specific constructions herein shown and described.

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

1. In a carving-machine, the pattern and work holding and feeding means, in combination with a tool-head, a plurality of driven cutters and a pattern-tracer held therein, a retracting mechanism normally connected with said head but capable of being disconnected therefrom, said mechanism being operative to retract said tracer and cutters when the tracer is pressed upon by the pattern, and said tracer and cutters being laterally operable by hand when said head and said mechanism are disconnected, substantially as described.

2. In a carving-machine, the work and pattern holding and feeding means, in combination with a tool-head, a tracer and a cutter-spindle provided therein, automatic means for retracting said head and therewith said tracer and spindle, whenever the tracer encounters a projection in the pattern, means for driving said spindle, parallel-motion means holding said head and adapting the same for various lateral movements by hand, substantially as described.

3. In a carving-machine, the work and pattern holding and feeding table, in combination with a tool-head, flexible means whereby said head is suspended and adapted for vertical

movement, a tracer and a cutter-spindle provided in said head, the spindle being suitably driven, the parallel-motion connections for said head, occupying a substantially horizontal plane and swiveled to said head, and permitting lateral movement of said head, and an automatic retracting mechanism operative upon said head and normally guiding the same for movement perpendicular to said table, substantially as described.

4. In a carving-machine, the work and pattern holding and feeding means, in combination with the tool head or frame, the cutter-spindles journaled therein, the tracer attached thereto, means suspending said head for vertical movement and permitting the horizontal movement thereof for hand operation, means for fixing said head against horizontal movement and moving the same vertically, substantially as described.

5. In a carving-machine, the work and pattern holding and feeding means, in combination with the tool-head the tracer and the cutter-spindles provided therein, and the driven retracting mechanisms provided at the ends of said head, as and for the purpose specified.

6. In a carving-machine, the work and pattern holding and feeding means, in combination with the tool-head the tracer and cutter-spindles provided therein, means sustaining the weight thereof, the retracting devices in moving connection with the ends of said head and adapted to retract said head automatically and said head being adapted to be freed from said retracting devices and thereafter to move in all necessary directions for hand-carving, substantially as described.

7. In a carving-machine, suitable means for holding and feeding the pattern and work, in combination with a rigid tool-head, the tracer and the cutting-tools carried thereby, means sustaining the weight of said head, said head having bifurcated ends, the revolving retracting devices engaged with said ends and when pressed upon thereby adapted to retract said head, substantially as described.

8. In a carving-machine, suitable means for holding and feeding the pattern and work, in combination with the tool-head provided with tracing and cutting tools and suitably sustained, the bifurcated ends of said head, the disks arranged in engagement with the ends of said head and whereon said ends are pressed and cramped when the tracing-tool is engaged by the pattern, substantially as described.

9. In a carving-machine, the work and pattern holding means, in combination with the tracer and cutter-head, a suitable frame, a shaft journaled thereon above said head, means tending to rotate said shaft, the pulleys on said shaft and the flexible connections between said pulleys and said head, as and for the purpose specified.

10. In an automatic carving-machine, a suitable frame, in combination with work and pat-

tern holding means movable therein, the tool-head, means sustaining the same, the revolvable disks provided in said frame and having hubs engaged with the ends of said head, said disks being operative to retract said head, substantially as described.

11. In an automatic carving-machine, a suitable frame, in combination with pattern and work holding means movable therein, a mechanism for actuating said means, the tool-head, the tracer and the cutter-spindles provided therein, the parallel-motion structure pivotally joining said frame and head, the spindle-driving devices therein, the detachable bifurcated blocks upon said head, the rotary devices engaged with said blocks for retracting said head and the means sustaining the weight of said head, substantially as described.

12. In an automatic carving-machine, the frame in combination with work and pattern holding means movable therein, the tool-head occupying a plane that is perpendicular to the plane of said means, the tracer and cutting-tools provided in said head, spring-actuated means tending to retract said head and the positively-operable retracting devices provided at opposite ends of said head, substantially as described.

13. In a carving-machine, a suitable frame, in combination with work and pattern holding means movable in said frame, the tool-head, the tracer and the cutting-tools provided therein, means for driving said tools, means partially sustaining said head, the rotary disks provided in said frame, at the ends of said head and said head having friction-buttons on opposite sides of each disk, as and for the purpose specified.

14. In a carving-machine table, the combination of the frame with the pairs of parallel T-bars, the clamps 32 hooked therein and provided with clamping jaws or points, substantially as described.

15. In a carving-machine, a suitable frame, in combination with pattern and work holding means therein, the tool-head provided with tracing and cutting tools, the latter suitably driven, the shaft 62 arranged above said head, the pulleys 65 upon said shaft, the cables or cords wound thereon and sustaining said head, the smaller pulleys 64 on said shaft, the cables wound thereon and the springs 58 whereto said cables are connected, as and for the purpose specified.

16. In a combined automatic and hand carving-machine, a feed-table and means for actuating the same, in combination with a tool-head carrying tools that are perpendicular to said table, a tool-head-retracting mechanism constantly driven and normally engaged with said head, said mechanism being operable to retract said head and the tools therein when said head is subjected to pattern-pressure, flexible means sustaining said head and partially supporting the weight thereof, means

for disconnecting said head from said retracting mechanism for movement irrespective thereof, and a parallel-motion mechanism connected with said head and restricting the free movement thereof, substantially as described.

17. In a combined automatic and hand carving-machine, a work-feeding table and means for reciprocating and feeding the table, in combination with a tool-head extending transversely of said table, parallel-motion means for maintaining the transverse relation of said head to the table, and connected to said head by universal joints to permit longitudinal, vertical and tilting motions of said head, flexible means sustaining said head, an automatic power-actuated retracting mechanism and means for connecting said head to said retracting mechanism, substantially as described.

18. In a combined automatic and hand carving-machine, the machine-frame and a feed-table provided therein, in combination with a tool-head arranged above said table, flexible supports for said head, a plurality of cutter-spindles arranged in said head, a driving-shaft parallel with said head, means extending therefrom for driving said cutter-spindles, a parallel-motion device for maintaining the parallel relation of said head and shaft and permitting various hand movements of the head with relation to said table, a tracer and a pattern together limiting the downward movement of said head, automatic retracting mechanisms arranged at the ends of said head and means for connecting said head thereto for automatic vertical retraction thereby, substantially as described.

19. In a carving-machine, a suitable frame, in combination with a work-feeding table, means for actuating said table, a tool-head arranged above said table, tools in said head, a pattern and a tracer, the one held by said head and the other by said table, rotary disks provided in said frame at the ends of said head, and said head having frictional parts on opposite sides of each disk for engagement with and operation by said disks when said head is subjected to pattern-pressure, substantially as described.

20. In a carving-machine, the machine-frame, in combination with a work-feeding table arranged therein, means for actuating said table, a tool-head arranged above said table, flexible means extending from above said head and sustaining the same, a plurality of cutting-tools carried by said head, a shaft in said frame parallel with said head, the pulley-frame 93 parallel with said shaft and journaled in the machine-frame, the jointed arms connecting said frame 93 to said head, the parallel bar or frame 97 joining said toggles, and pulleys provided on said shaft, said frame 93, said frame 97 and said cutting-tools, connected by suitable belts, substantially as described.

21. In a carving - machine, the machine-frame, in combination with the feed-table therein, a winding-shaft arranged above said table in said frame, the springs acting on said shaft, the tool-head 50 and the flexible connections wound on said shaft and sustaining said head, substantially as described.

22. In a carving-machine, the feed-table provided with rods 25, in combination with the work-elevating clamps, each comprising two parts, 27, 28, having notches for engagement with a rod 25 and means for tightening said parts on such rod, the parallel work-holding bars arranged on the upper ends of said clamps and means for securing the work or panels on said bars, substantially as described.

23. In an automatic carving-machine, the

side frames, in combination with the horizontal bracket-bars, 6, thereon, the cross-bars 3 connecting said side frames, the bed for reciprocating on said bracket-bars 6, the bed-reciprocating mechanism and the depending truss-bars attached to said cross-bars 3 and supporting said reciprocating mechanism, substantially as described.

In testimony whereof we have hereunto set our hands this 5th day of November, 1902.

CHARLES L. RUEHS.
FRANK STREICH.

Witnesses:

E. G. VREELAND,
GEORGE KELLY,
C. E. HAWLEY.