W. J. EGAN.

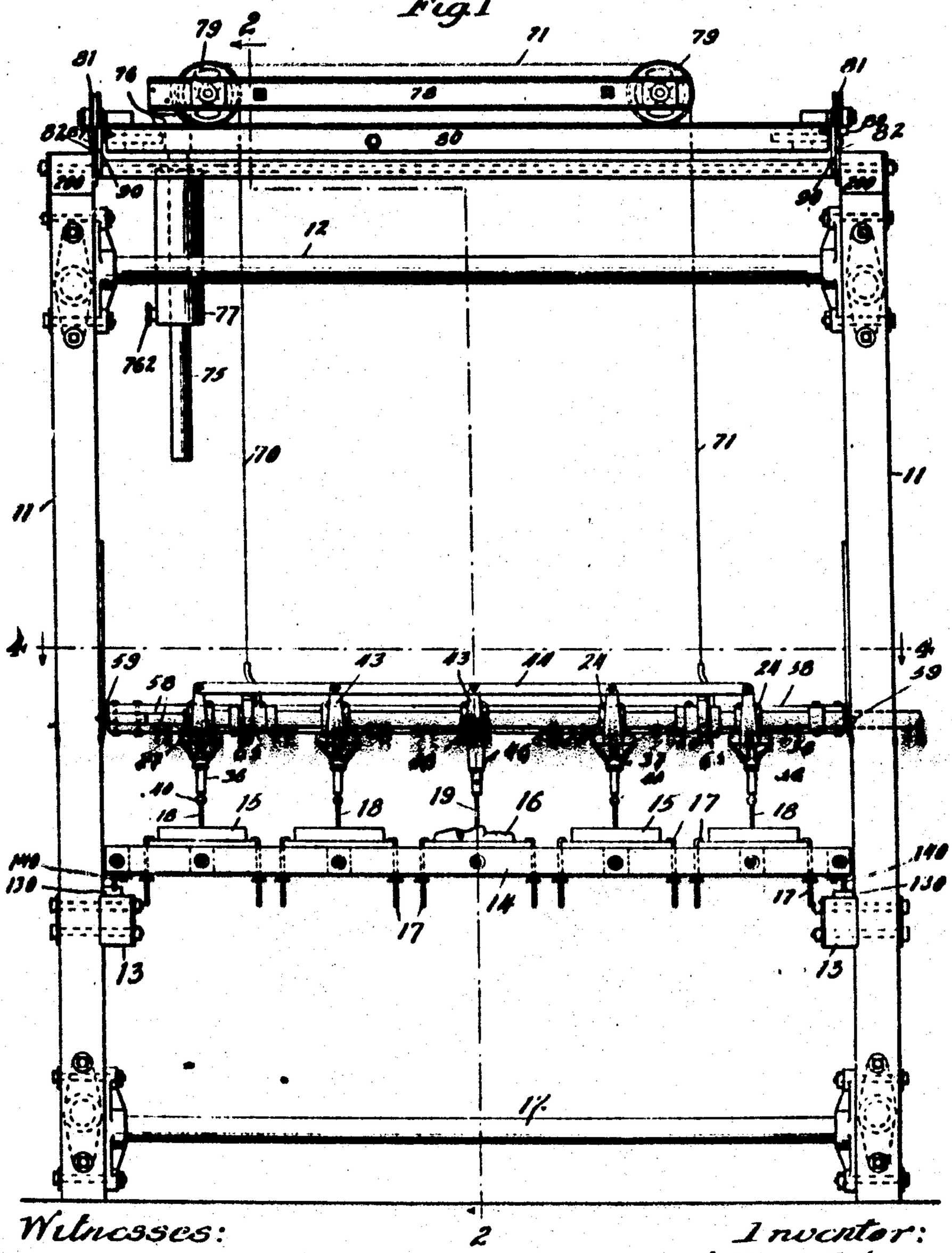
WOOD CARVING MACHINE.

APPLICATION FILED NOV. 10, 1906.

899,519. Patented Sept. 29, 1908.

6 SHEETS—SHEET 1.

Fig. 1



Witnesses:

Wm. Geiger

H. M. Kinsey

Inventor:

William J Egan

By Mowday, Evarts, Adcock & Clark.

Attorneys

W. J. EGAN.

WOOD CARVING MACHINE.

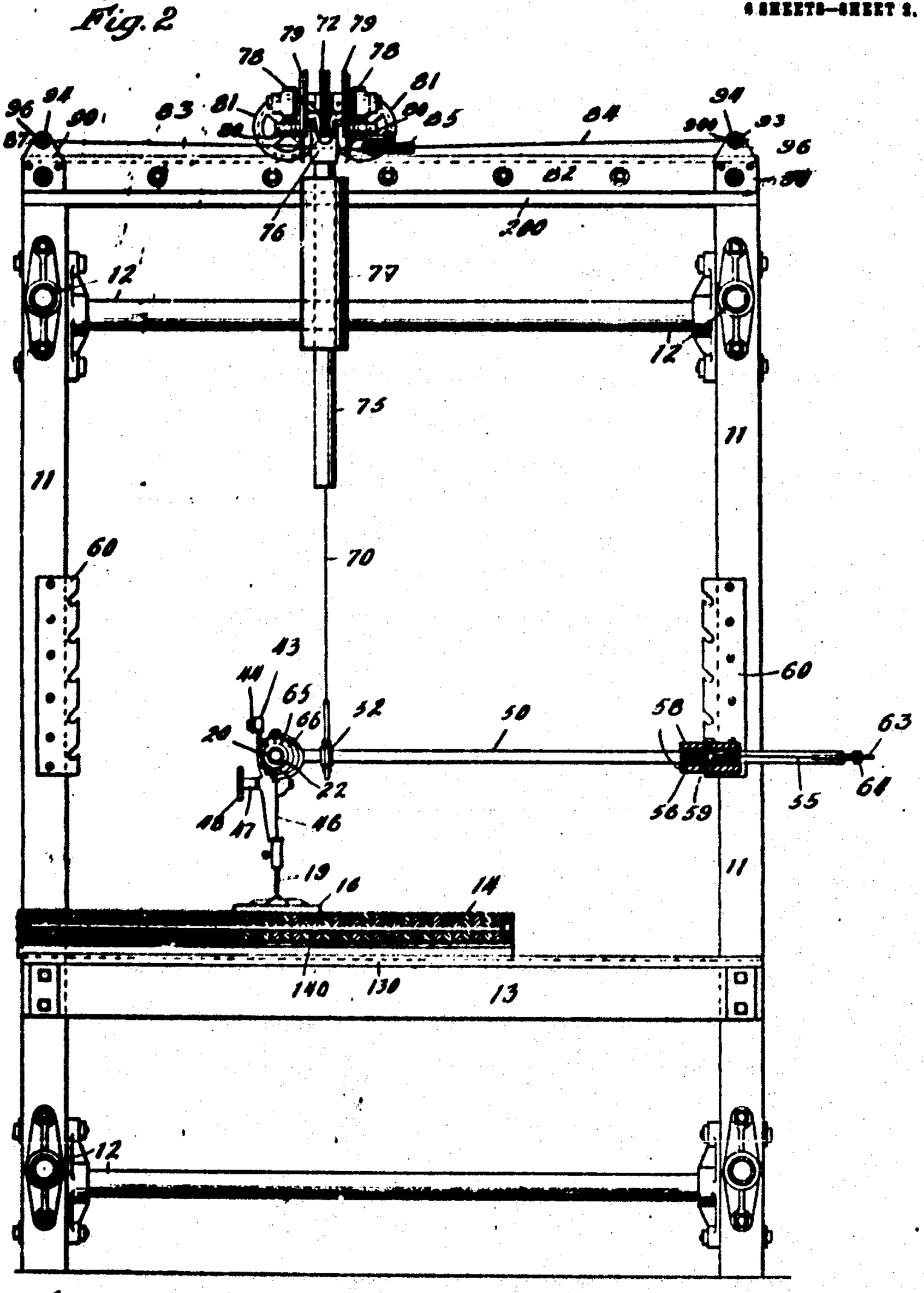
APPLICATION FILED NOV. 10, 1906.

899,519.

Patented Sept. 29, 1908.

6 SHEETS—SHEET 2.

Fig. 2



Witnesses:

Wm. Gager

H. W. Williams

Inventor:

William J. Egan.

By Munday, Evarts, Adcock & Clark.

Attorneys

W. J. EGAN.

WOOD CARVING MACHINE.

APPLICATION FILED NOV. 10, 1906.

899,519. Patented Sept. 29, 1908.

6 SHEETS—SHEET 3.

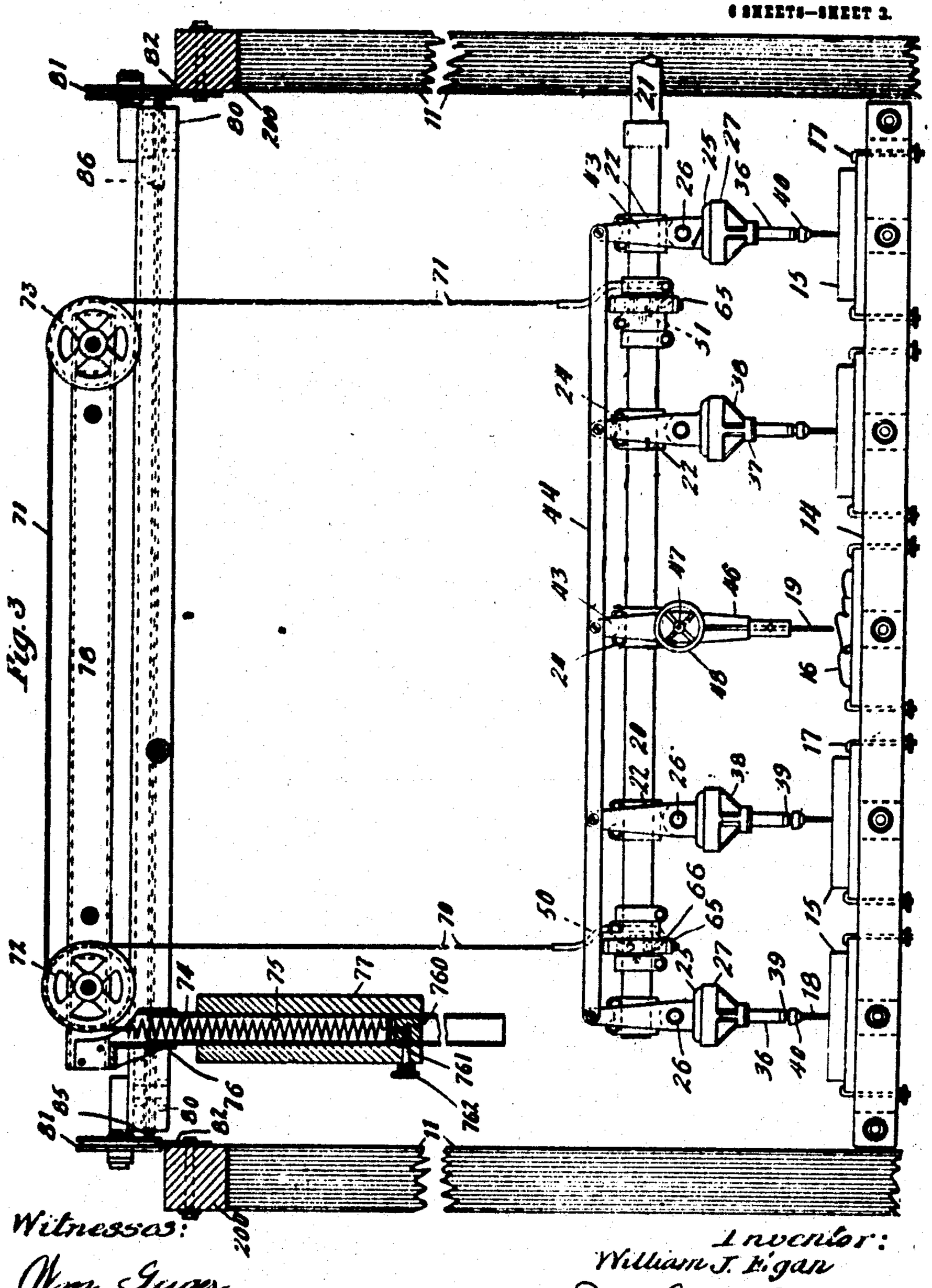


Fig. 3

Witnesses:

Wm. Geiger

H. W. Hendy

Inventor:

William J. Egan

By Munday, Evarts, Adcock & Clark

Attorneys

W. J. EGAN.

WOOD CARVING MACHINE.

APPLICATION FILED NOV. 10, 1906.

899,519. Patented Sept. 29, 1908.

6 SHEETS—SHEET 4.

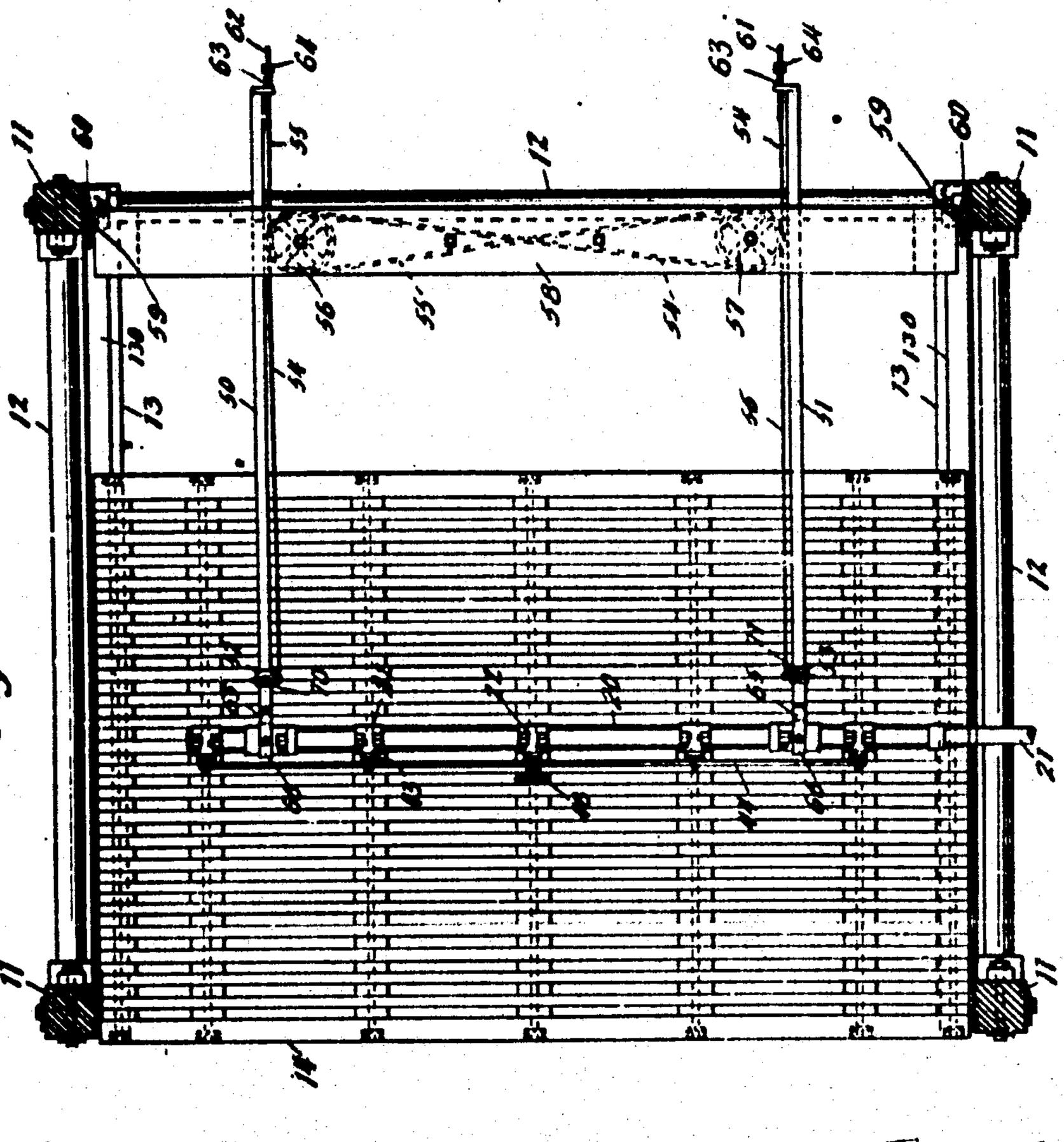


Fig. 4.

Witnesses:
Wm. Geiger
W. M. Bunday

Inventor:
William J. Egan
By Munday, Evarts, Adcock & Clarke.
Attorneys

W. J. EGAN.

WOOD CARVING MACHINE.

APPLICATION FILED NOV. 10, 1908.

899,519. Patented Sept. 29, 1908.

6 SHEETS—SHEET 5.

Fig. 5

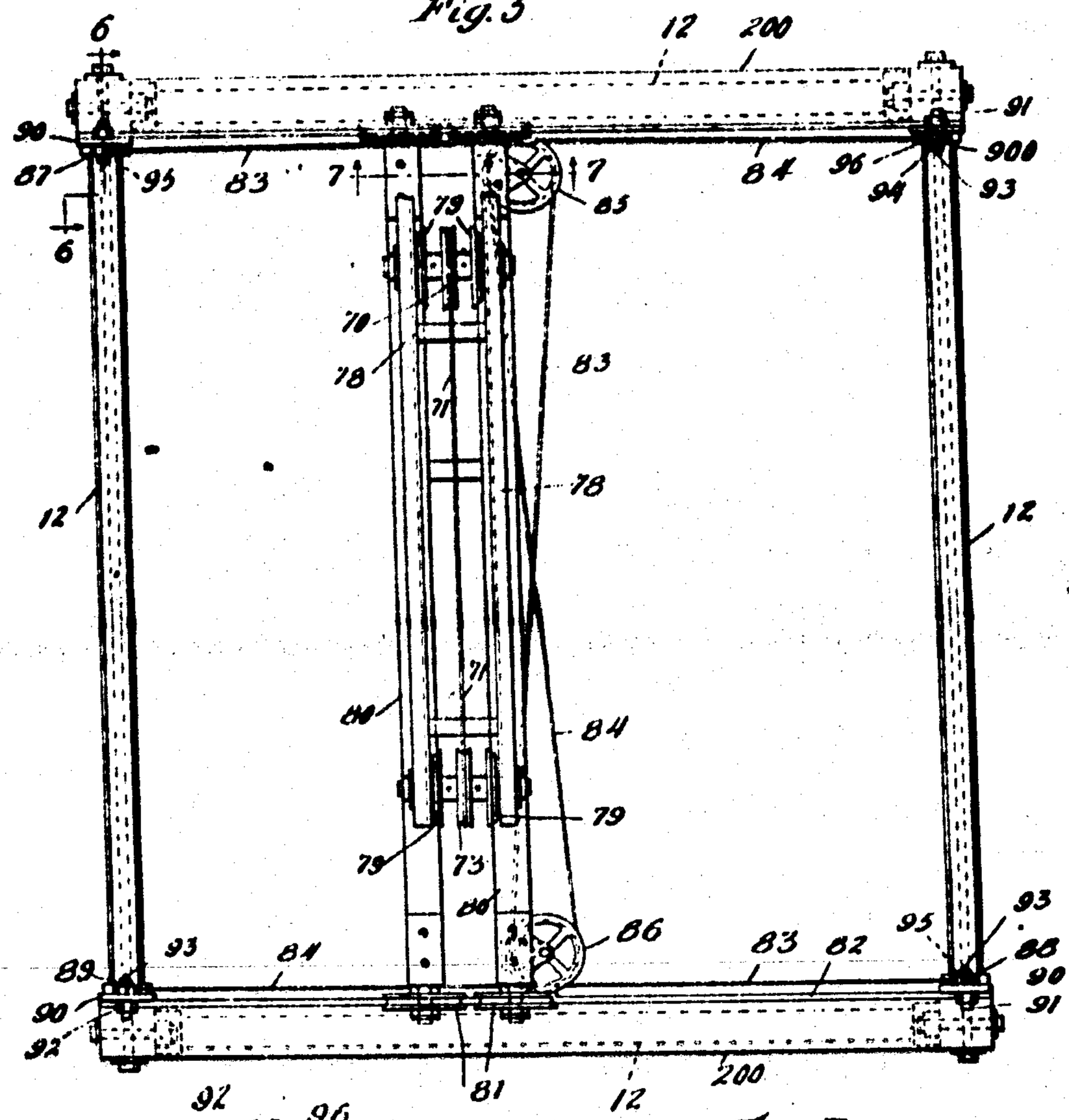


Fig. 6

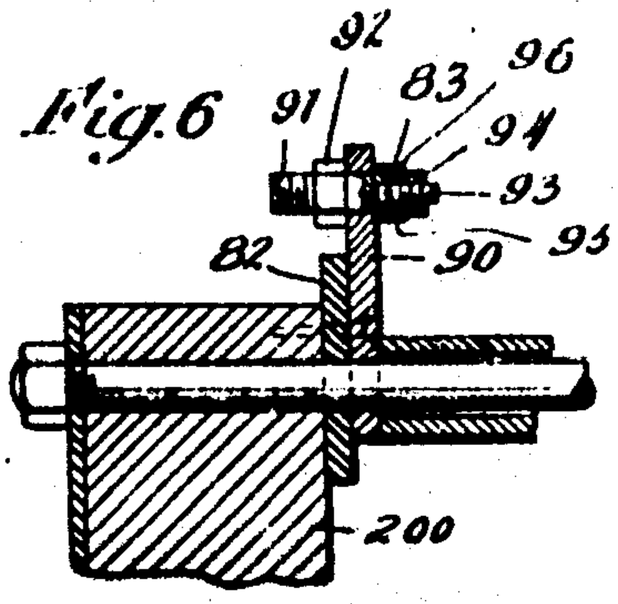
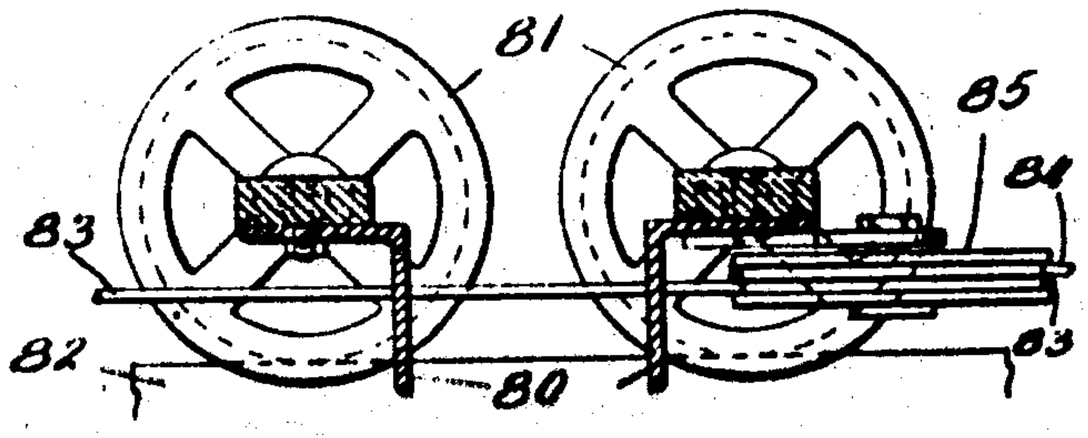


Fig. 7



Witnesses:

Wm. Geiger

H. M. Munday

Inventor:

William J. Egan

By Munday, Evarts, Adcock & Clark.

Attorneys

W. J. EGAN.

WOOD CARVING MACHINE.

APPLICATION FILED NOV. 10, 1906.

899,519.

Patented Sept. 29, 1908.

6 SHEETS—SHEET 6.

Fig. 8

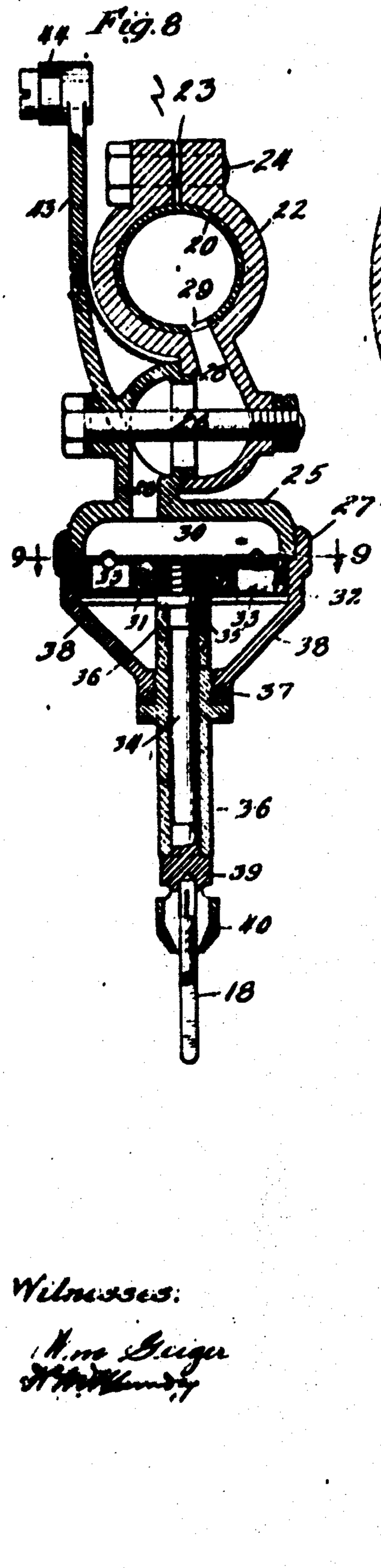


Fig. 9

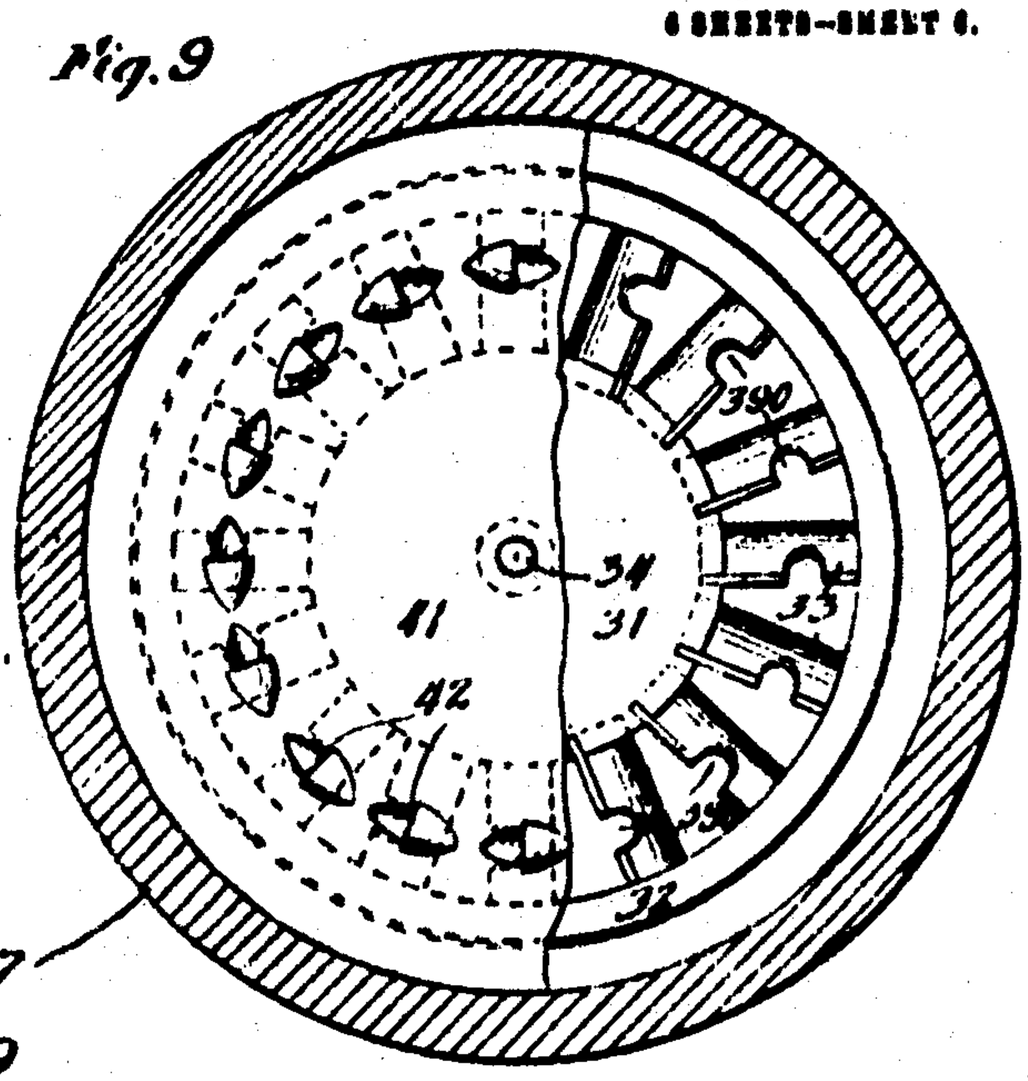
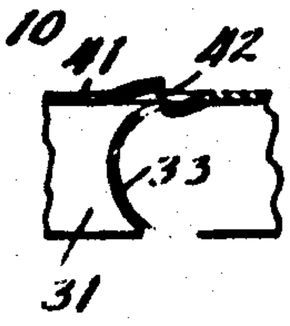


Fig. 10



Witnesses:

Nina Geiger

H. Whitney

Inventor:

William J. Egan

By Munday, Evarts, Adcock & Clark.

Attorneys

UNITED STATES PATENT OFFICE.

WILLIAM J. EGAN, OF CHICAGO, ILLINOIS, ASSIGNOR TO EDWARD P. HATCH, OF LA GRANGE, ILLINOIS.

WOOD-CARVING MACHINE.

No. 869,519. Specification of Letters Patent. Patented Sept. 29, 1907.

Application filed November 10, 1906. Serial No. 343,792.

To all whom it may concern:

Be it known that I, WILLIAM J. EGAN, a citizen of the United States, residing in Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Wood-Carving Machines, of which the following is a specification.

This invention relates more particularly to the construction of wood carving machines adapted to carve simultaneously a plurality of separate but uniform pieces of work, but certain features of the invention may have a broader utility and be applicable elsewhere than in a carving or multi-carving machine.

My objects therein have been to simplify the machines and thereby render them less likely to get out of order than previous constructions, to greatly increase their capacity, to give the cutters an increased range of adjustment whereby they are adapted to the performance of work hitherto deemed impossible upon these machines, and otherwise to improve the construction.

The principal feature of the invention is found in the means adapted for driving the carving tools.

Heretofore the tools have generally been driven by belts as the most favored means for actuating them, but belts are subject to many and serious objections, due largely to their stretching and the many changes in position to which the tools are subject, and which are generally required of them in the doing of a single piece of work. The belts also are not capable of revolving the cutters at as high a speed as is desirable. I have conceived that the belts may be wholly dispensed with, and the cutters be driven at a greatly increased speed by employing compressed air as the power supplying agent, and providing each cutter with a separate actuating turbine or other suitable construction of winged wheel adapted to be rotated by the compressed air. By this change I not only greatly simplify and improve the machine and enable it to do much more and better work than has hitherto been possible, but I am also enabled to give the cutters an increased range of adjustment enabling them to do work which could not be done by the machines whose cutters were driven by belts.

The carving tool and actuating mechanism hereinafter described may be employed singly as well as in gang. The turbine rotating mechanism set forth may be utilized otherwise than in actuating a wood carving drill and the rotary movement generated may even be transformed into a reciprocating movement for the actuation of a tool that is required to have a back and forth movement with or without a factor of rotation.

Figure 1 is a front elevation of my improved carving machine. Fig. 2 is a section on the line 2—2 of Fig. 1. Fig. 3 is an enlarged vertical section. Fig. 4 is a horizontal section on the line 4—4 of Fig. 1. Fig. 5 is a plan. Figs. 6 and 7 are sections on the lines 6—6 and 7—7 respectively of Fig. 5. Fig. 8 is a central longitudinal section of the cutter. Fig. 9 is a section on the line 9—9 of Fig. 8 partly broken away. Fig. 10 is a detail section of one of the turbine wheels actuating the cutters.

In said drawing, 11 represents the corner uprights and 12 and 200 are horizontal bars and beams uniting the uprights and forming with them the frame of the machine. Bolted to the uprights 11 at each end of the machine are beams 13 forming ways upon which the work table 14 may be supported and adjusted forward or back. I prefer to provide the table with angle iron runners 140, and the beams with strips 130 upon which the runners bear. One of the strips is thicker than the other and grooved so that it acts as a guide. The blocks 15 to be carved as well as the pattern 16 are secured to this table in any suitable way, as for instance by the bolt hooks 17. The table is adapted to permit the positioning of the hooks wherever necessary as will be understood from Fig. 4.

The gang of carving tools 18, as well as the pattern tracer 19 are supported from a tube 20 which I call the header tube and which is connected by a flexible pipe 21 to a tank or reservoir charged with air under the desired degree of pressure or to an air compressor and is arranged parallel to the work bed of the machine. Each of the carvers is provided with a head 22 fitting the outside of the header tube 20 and split as at 23 so it may be made to clamp the tube by tightening the bolt 24. The heads are joined to chambered castings 25 by pivot bolts 26, and the castings 25 are threaded at their bottoms and engage the casings 27 of turbine wheels to be described later on. In the heads 22 and castings 25 are formed air passages 28 con-

necting with the ports 29 in the header tube and leading into chambers 30 in the bottom of castings 25 and directly over the wheels.

The wheels consist of hubs 31, rims 32 and vanes 33 arranged between the hubs and the rims and preferably of the concavo-convex form shown. The hubs are threaded on the upper ends of spindles 34, and the spindles have collars 35 resting on the tops of tubular bearings 36 threaded into the ring 37 formed at the bottom of the converging arms 38 of the casings 27. At their lower ends the spindles have enlargements 39 in the shape of split cones and carrying nuts 40 in which the carving tools are entered. Immediately over the wheels and clamped between the casing and the chambered castings are flat air-distributing plates 41 in which openings 42 are formed in such relation to the vanes of the wheels as to admit air to the vanes. And in order that the openings may direct the air so it will be effective upon the vanes, I prefer to form them by slitting the plates and bending the metal up at one side of the slit and downward at the other side as seen at Fig. 10. The downward bend thus given the plate necessitates the notching out of the vanes as seen at 390.

The joints between the heads 22 and castings 25 are such as permit a rocking by the latter on the pivots 26, to carry the tools in lateral directions, and in order that these movements may be uniform in the case of the tracer and tools, I provide the chambered castings and the tracer with upwardly extending arms 43, and these arms are all pivotally joined at their tops to a horizontal bar 44. The tracer holder is made in two parts with the lower part 46 pivoted to the upper part and the joint is located in the same plane as that between the heads and chambered casings of the tool holders. The pivot of the joint is also a screw 47 and operated by a hand wheel 48. By tightening screw 47, the parts of the joint are brought together and the rocking movements mentioned are prevented and by loosening it the parts are released and the movements permitted.

For the purpose of controlling the movements of the header tube, so that both ends of it shall move in the same direction and to the same extent, and thus secure uniformity in the work done by the different cutters, I attach it at its ends to horizontally arranged bars 50 and 51 extending backward from the tube and provided with equalizing means which are desirably constructed as follows: At the forward end of the bars are clips 52 and 53 to which flexible wires or cords 54 and 55 are attached. These wires or cords extend backward and are passed partly around the sheaves 56 and 57, supported in a cross frame composed of flat plates or bars 58 bolted together and having pins 59 at their ends adapted to enter the notched supporting plates 60 attached to the rear uprights 11. The wire or cord 54 passes first partially around the rear side of the sheave 56, thence across to the opposite side of sheave 57 and from sheave 57 to a tension regulating screw 61 at the rear end of bar 51, and the wire or cord 55 passes from clip 53 around the rear side of sheave 57, thence to the forward side of sheave 56 and thence back to the tension screw 62 at the rear of bar 50. The tension screws are preferably provided with springs 63 between nuts 64 and the bars to which the screws are attached, so that the wires will be held taut to the proper degree, and at the same time be permitted to yield slightly. At the forward ends the bars 50 and 51 are attached to the header tube by means of yokes 65 engaging collars 66 on the tube. With this construction it will be noted that wherever the tube is taken hold of by the operator to direct it forward or back, the same amount of movement will necessarily be given to both ends of it.

The tube and the forward ends of the equalizing bars are supported by flexible wires 70 and 71 attached to the bars by the clips 52 and 53 and extending upward over the pulleys 72 and 73 to counterbalancing devices which may be constructed in any suitable and known way. One suitable way is particularly shown at Fig. 3. The wire 71 passes first over pulley 73 and thence over pulley 72 while wire 70 passes over pulley 72 only. After they have passed pulley 72, both wires extend downward and are joined to a spring 74 located in a tube 75 attached to a bracket 76. This tube I prefer to protect by a surrounding cylinder 77 and within the tube is an adjusting piece 760 attached to and regulating the spring, and provided with a locking screw 761 entering the slotted side of the tube and provided with a clamping nut 762. The pulleys 72 and 73 are supported in a carriage of which the bars 78 form the longitudinal members, and furnished with carrying rollers 79 moving in directions parallel with the header tube upon ways 80. The ways 80 are also connected together by cross braces, so that they form a carriage movable at right angles to the movement of the carriage just described, being for this purpose equipped with rollers 81 at their ends, arranged at right angles to the ways. These rollers travel on flat bars 82 at the ends of the machine. An equalizing mechanism very similar to that used with the equalizing bars 50 and 51 is used with the ways 80, and consists of wires 83 and 84, and pulleys 85 and 86 attached to one of the ways as shown at Figs. 5 and 7. The wire 83 of this mechanism is attached to the frame of the machine at 87, and after passing partially around the pulley 85 is carried to pulley 86 and from thence to a stationary attachment at 88, and wire 84 is attached at the corner 89 of the frame and

passes first partially around pulley 86, thence to pulley 85 and thence to the corner 900. This mechanism insures equal and steady movement by all parts of the carriage formed of the ways 80.

Fig. 6 shows the method of attaching the wires 83 and 84 at the corners of the machine. Projecting plates or brackets 90 are secured adjacent to the bars 82 and provided with short screws 91 adapted to be inserted in openings formed in the brackets and provided with nuts 92 on one side of the brackets and nuts 96 on the other side thereof. The ends of the screws are made hollow and fitted to receive the ends of smaller screws 93 having nuts 94. A transverse opening 95 is formed in the screw 91 and also in the screw 93 and nut 96. These openings are all brought into register, and the end of the wires 83 and 84 is entered in them, so that if screw 91 is turned the wire will be wound up or tightened, and when the wire has been brought to the desired tension, the nuts 92 and 94 are made tight so as to hold the tension.

The notched plates 60 are duplicated upon the front uprights 12, so that the header tube can be reversed from the position shown and its equalizing devices supported from said front uprights. If necessary the table may also be reversed, in which case the angle iron runner now shown at the right of Fig. 1 will exchange places with the guiding runner at the other side of the machine and serve to guide the table in the same manner.

It will be noted that not only are the carving tools adapted to be tipped on their pivots 26, but that they are adapted to be carried back and forth and also to the right or left to any extent needed. Also that the equalizing device regulating the forward and backward movements of the header may be secured to the front or rear uprights as desired, so that the header and tools may be reversed from the positions shown and face the rear of the machine.

The use of a turbine of the character above indicated, for actuating the tools, permits the maintenance of a much higher speed of revolution than could be successfully imparted by pulleys or similar mechanism and at the same time provides the most direct possible application of power to the said tools and a more even and steady high speed movement than could be otherwise imparted to them. This is due partially to the fact that in employing a turbine, the power applied is more perfectly equalized around the axial center of the tool than would be possible in the employment of such mechanism as belts, which exert an unequal strain. A single drill or other tool might be effectively actuated in the manner hereinabove described, the pressure-driven turbine being peculiarly adapted to actuate any tool required to have an accurate high-speed rotary or reciprocating movement and to be actuated by the most direct possible application of power transmitted from a considerable distance or in varying directions and positions.

I prefer to operate the carving tools at one side of the tracer in one direction and those at the other side in the opposite direction. The air blast from the carving tools enables each tool to clear away its own chips, a great advantage particularly where the work is supported upon a horizontal table.

I claim:—

1. The wood carving machine, embodying carving tools each of which is provided with a turbine motor adapted to be operated by pneumatic power, a movable header supplying compressed air to said motors, and a rigid tracer for controlling the movements of said header.

2. The wood carving machine, embodying carving tools each of which is provided with a turbine motor adapted to be operated by pneumatic power, said motors being mounted axially on the tools, a movable header supplying compressed air to said motors, and a rigid tracer for controlling the movements of the header.

3. The wood carving machine, embodying carving tools each of which is provided with a turbine motor adapted to be operated by pneumatic power, a movable header supplying compressed air to said motors, supports for said header permitting changes of position by the tools, and a rigid tracer for guiding the header in such changes of position.

4. The combination in a wood carving machine, of a movable header tube supplying air under pressure, a series of rotating carving tools supported by said tube and projecting at right angles therefrom, a series of turbine wheels, one for each tool, each mounted on one of said tools and operated by air from the tube, a rigid tracer for controlling the movements of the tube and means for supporting said tube.

5. The combination in a wood carving machine, of a movable header tube supplying air under pressure, a series of rotating carving tools and a tracer supported by said tube and projecting at right angles therefrom, a series of turbine wheels, one for each tool, each mounted on one of said tools and operated by air from the tube, and means for supporting said tube.

6. The combination in a wood carving machine, of a movable header tube supplying air under pressure, a series of rotating carving tools supported by said tube and projecting at right angles therefrom, a series of turbine wheels, one for each tool, each mounted on one of said tools and operated by air from the tube, means for controlling the move-

ments of said tube so as to secure uniformity in action by the tools, and means for supporting the tube.

7. The combination in a wood carving machine, of a movable header tube supplying air under pressure, a rigid tracer whereby the movements of the tube may be directed, a series of rotating carving tools, a casing for each of said tools joined to the tube and having an air passage therethrough admitting air from the tube to the turbine wheels, and a turbine wheel mounted on said tool.

8. In a wood carving machine, the combination of a rotary carving tool, the turbine wheel mounted on and operating the tool, a casing surrounding the tool and wheel, and having an air passage through it and the header supplying compressed air to the casing, said casing having a flexible joint permitting changes in the direction of the tool independent of the header.

9. The combination with the series of rotary carving tools and a header to which they are attached, of a casing for each tool and a turbine wheel for operating the same, said casing embodying an air passage whereby the wheel is operated, and a flexible joint permitting changes in the direction of the tool independent of the header.

10. The carving machine having pneumatically operated carving tools, a separate holder for each tool, and a support to which the holders are rigidly attached, the holders of the tools embodying flexible joints permitting the deflection of the tools in lateral directions.

11. The carving machine having pneumatically operated carving tools, the holders of the tools embodying both air passages carrying air to the tools and flexible joints permitting lateral deflection of the tools.

12. The carving machine having pneumatically operated carving tools, a separate holder for each tool, a header to which the holders are rigidly attached, the holders of the tools embodying flexible joints permitting the deflection of the tools in lateral directions, and means uniting said holders so that all the tools will be deflected in unison.

13. The combination with an air supplying hollow header, and carving tools attached to said header and operated by air therefrom, of flexible supports for said header, and equalizing means for securing parallelism in the movements of the header.

14. The combination with the carving tools and the header to which they are attached and by air from which they are operated, of means for supplying air under pressure to said header, supporting devices for the header, and means for counterbalancing the weight of the header and tools.

15. The combination with the air driven tools and the hollow header to which they are attached and from which they receive the air, of means for supplying said header with air under pressure, means for controlling the movements of the header, and means for supporting the header.

16. The combination with the carving tools and the header to which they are attached, of supporting devices for the header, means for supplying the header with air under pressure and a traveling carriage to which the supporting devices are attached.

17. The combination with the carving tools and the header to which they are attached, of supporting devices for the header, a traveling carriage to which the supporting devices are attached, and a second carriage movable in directions at right angles to the movements of the first carriage and supporting the same and also provided with equalizing mechanism.

18. The carving machine consisting of pneumatic carving tools, a header on which the tools are mounted and from which they receive air, means for supplying air under pressure to the header, counterbalanced supports for the header and an overhead carriage to which the supports are attached.

19. The combination with a table supporting the work, of a series of pneumatically operated carvers, each having its own motor, a hollow header to which the tools are secured, and by which they are supplied with the operating fluid, and means for supporting such header adapted to permit it to be moved forward and back and to the right and left.

20. The carving machine consisting of pneumatic carving tools, a header on which the tools are mounted, counterbalanced supports for the header, means for supporting such header and permitting it to be moved both forward and back and to the right and left, and means for equalizing the movements in both directions.

21. The carving machine consisting of pneumatic carving tools, a header on which the tools are mounted, counterbalanced supports for the header, carriages movable at right angles to each other and mounted one upon the other, and supports for the header connected to the upper one of said carriages.

22. The combination in a carving machine, of a pneumatically driven carving tool and a pattern tracer whereby the tool is guided, the tool having an air passage through the casing surrounding it and its operating wheel whereby it is rendered self cleaning of chips.

23. The combination in a carving machine, of a plurality of individually and pneumatically driven carving tools, and a pattern tracer whereby the tools are automat-

ically and simultaneously guided, each tool having a surrounding casing and an operating wheel therein, and each casing having an air passage therethrough whereby the work is kept clear of chips.

24. In a carving machine, a pneumatically driven carving tool, having a surrounding casing and an operating wheel therein, said casing having an air passage through it which conducts the air from the wheel to the point of the tool, whereby the tool is rendered self clearing of chips.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses this 3rd day of October 1906.

WILLIAM J. EGAN.

Witnesses:
HENRY LOVE CLARKE,
ARTHUR B. WRIGHT.