

No. 757,084.

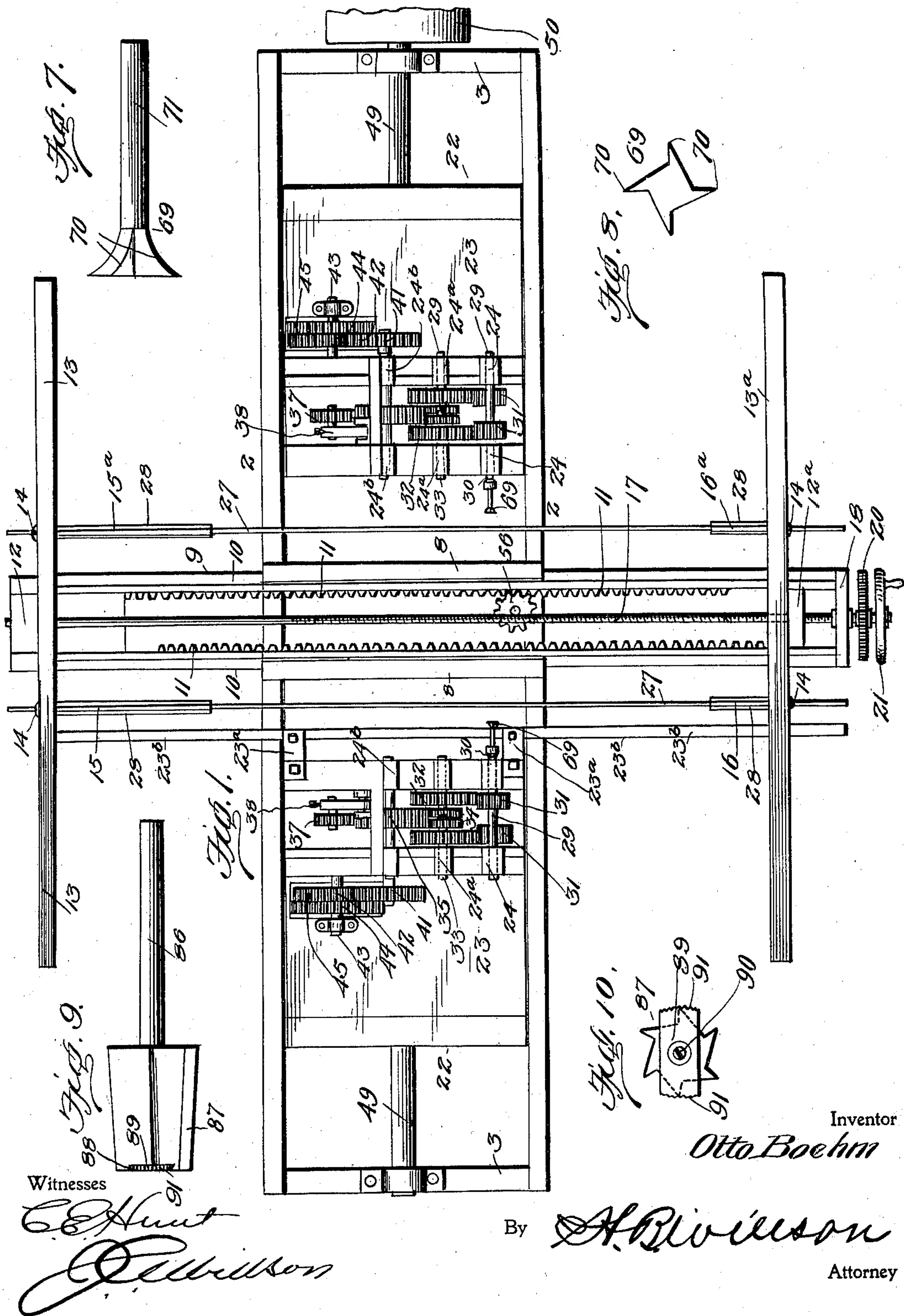
PATENTED APR. 12, 1904.

O. BOEHM.
GROOVING MACHINE.

APPLICATION FILED JUNE 25, 1903.

NO MODEL.

6 SHEETS—SHEET 1.



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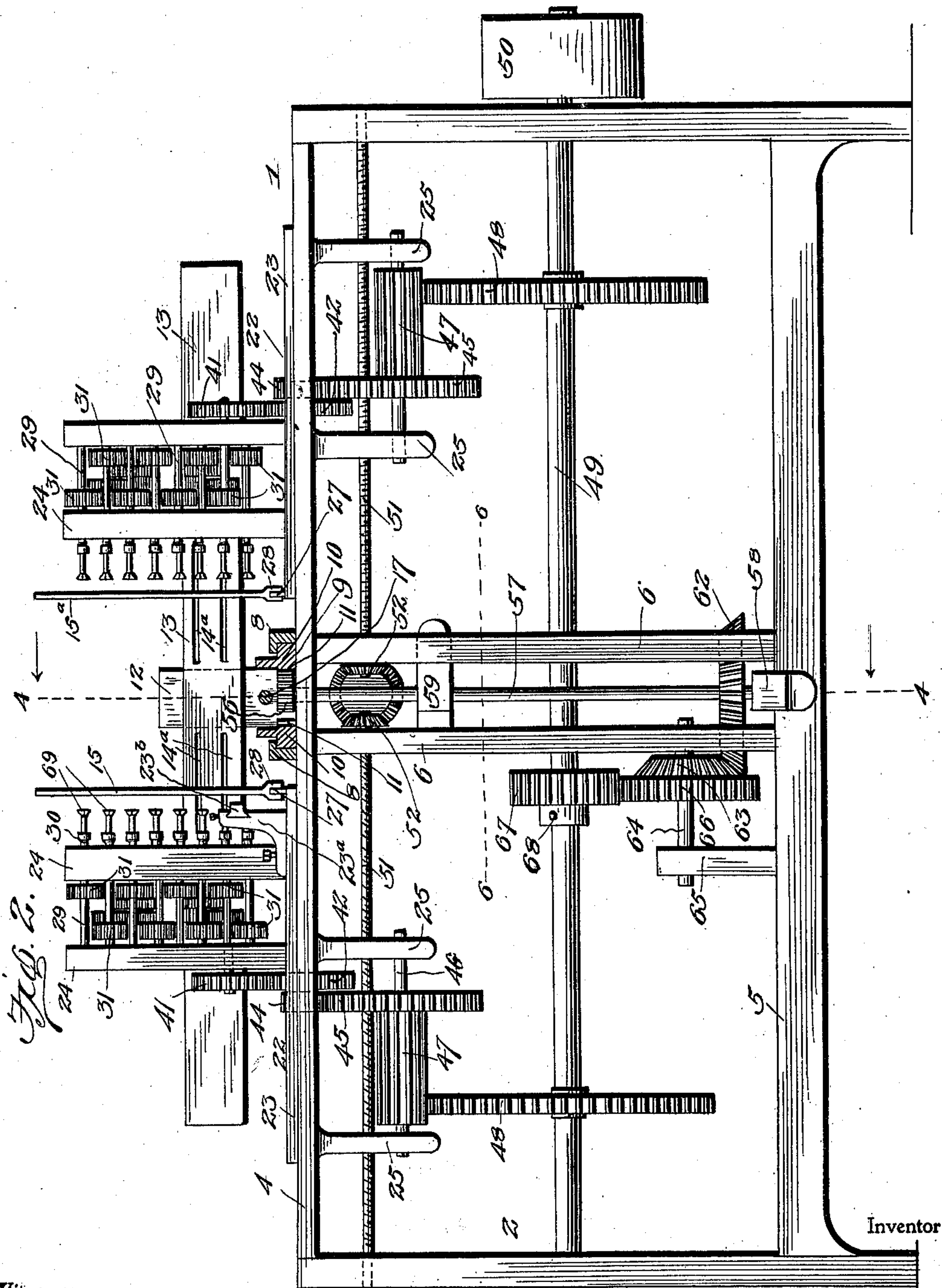
O. BOEHM.

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APPLIOATION FILED JUNE 25, 1903.

NO MODEL.

6 SHEETS—SHEET 2.



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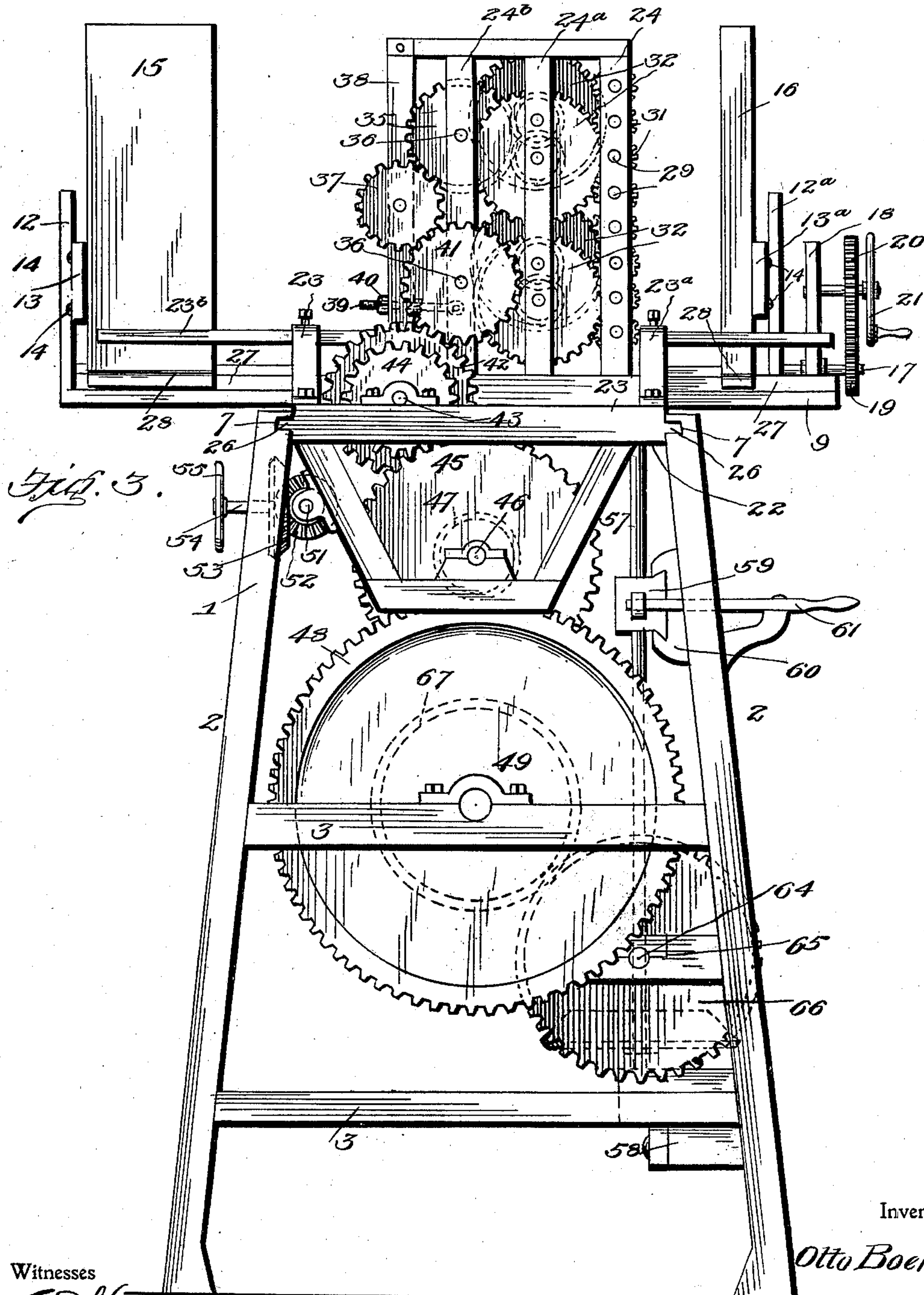
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6 SHEETS—SHEET 3.



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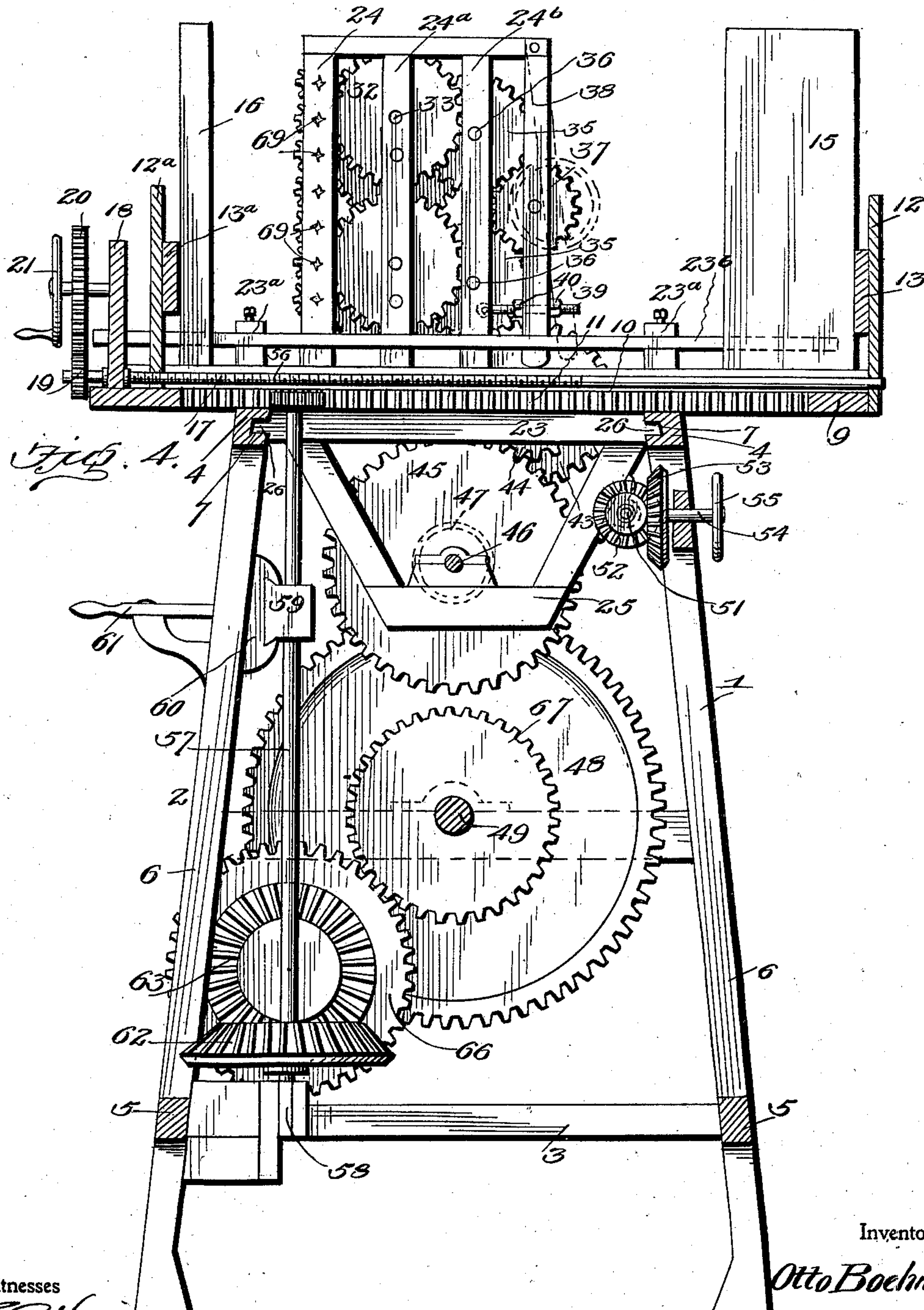
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6 SHEETS—SHEET 4.



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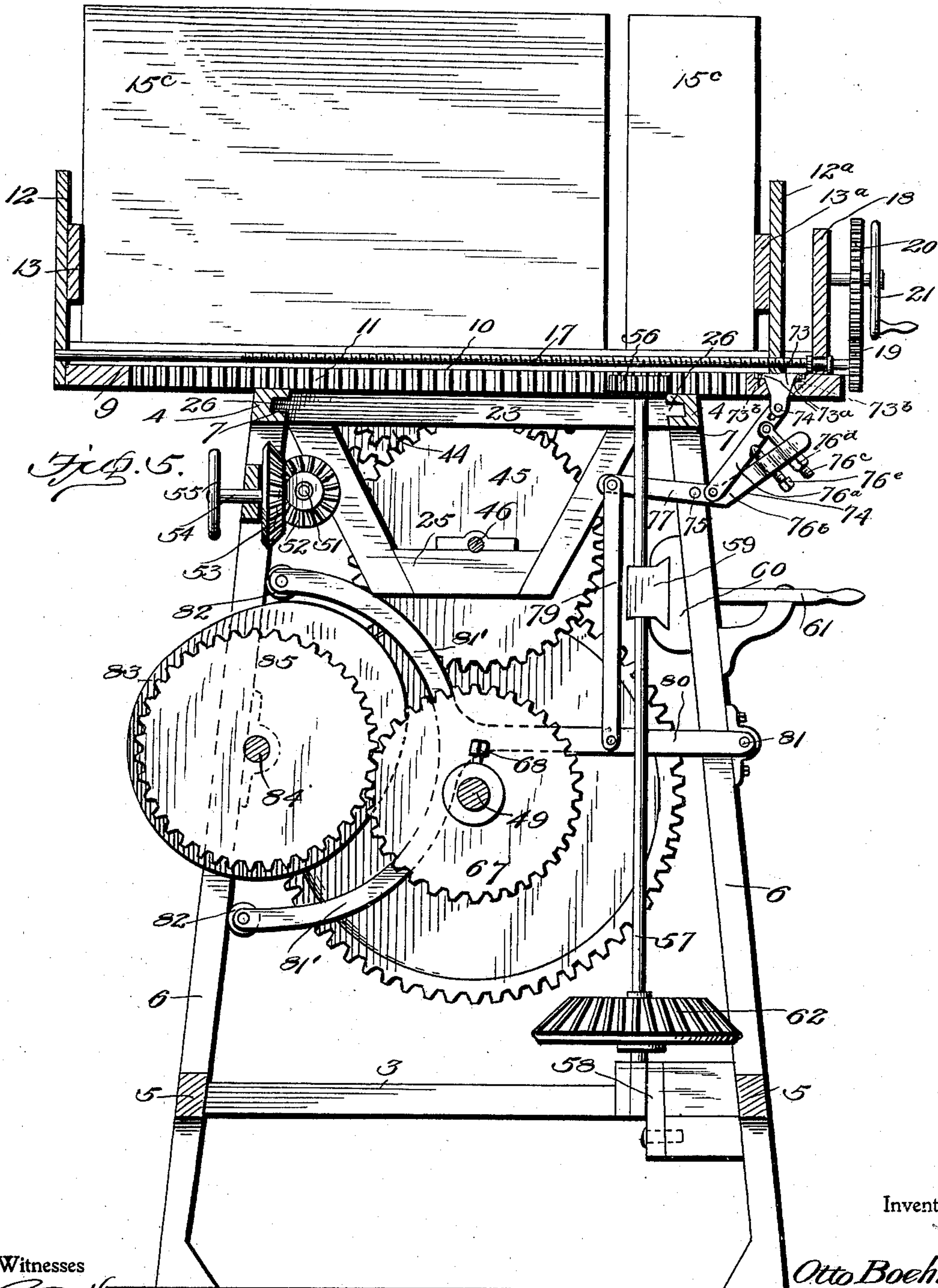
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GROOVING MACHINE.
APPLICATION FILED JUNE 25, 1903.

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6 SHEETS—SHEET 5.



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O. BOEHM.
GROOVING MACHINE.

APPLICATION FILED JUNE 26, 1903.

NO MODEL.

6 SHEETS—SHEET 6.

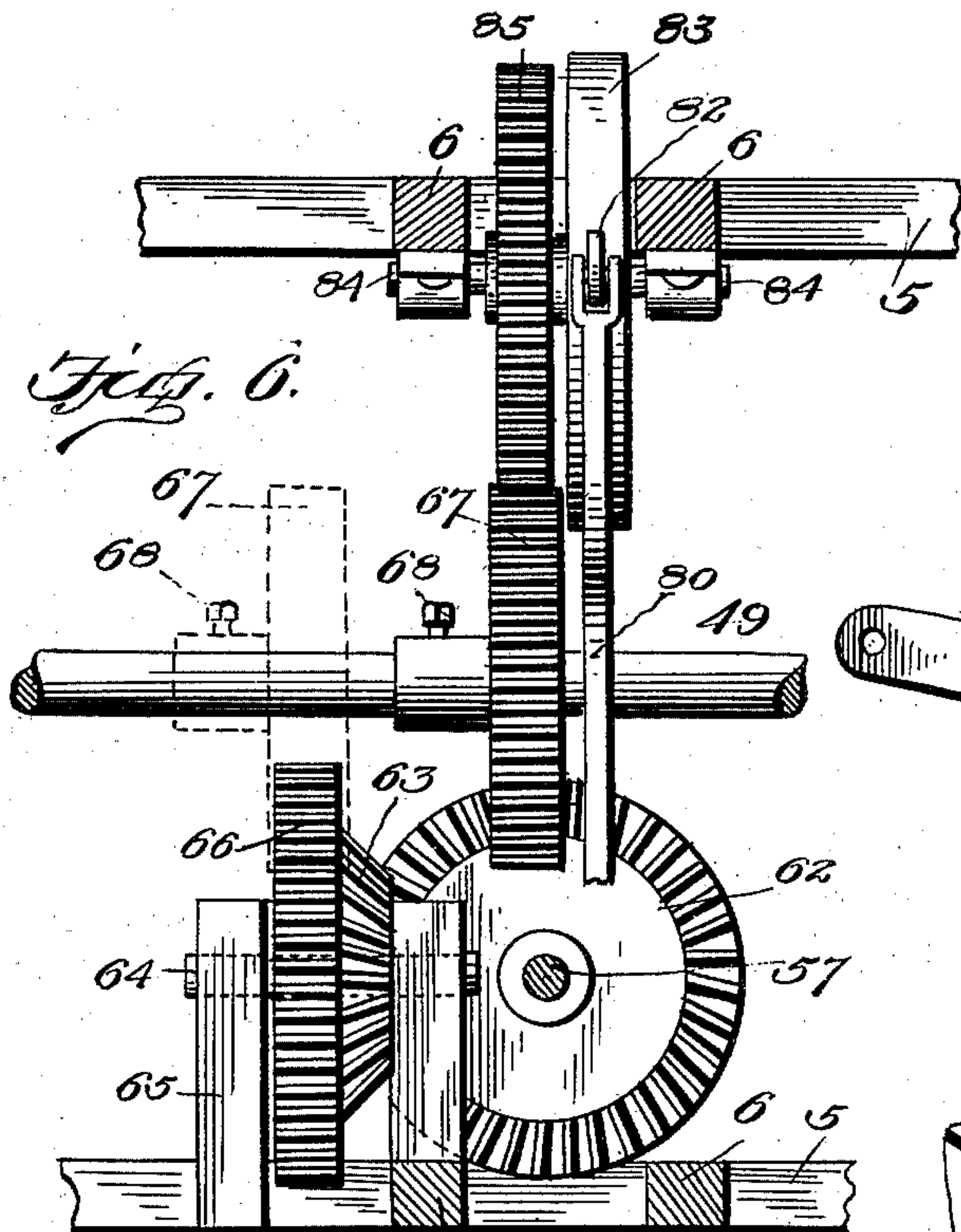


Fig. 6.

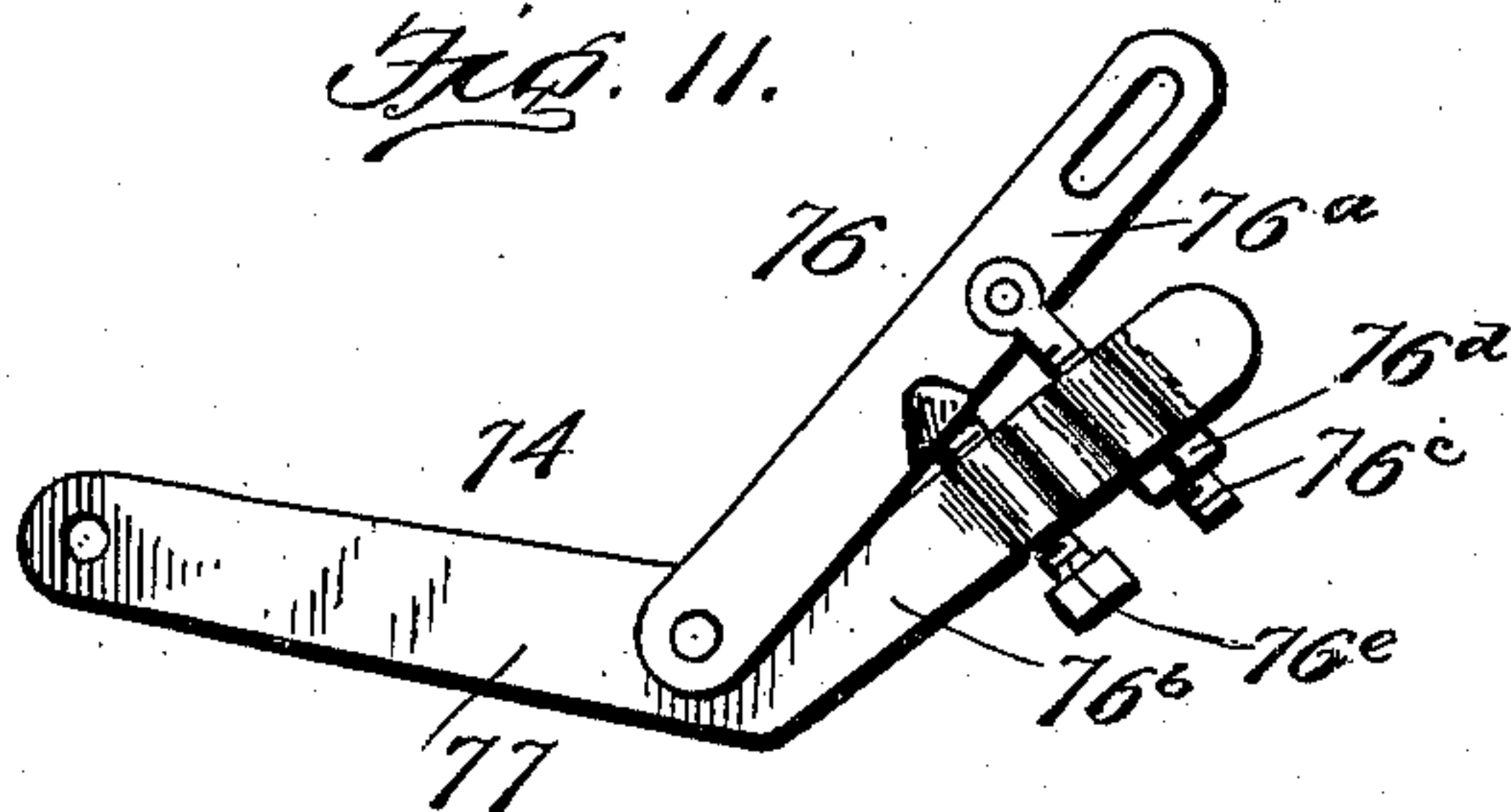


Fig. 11.

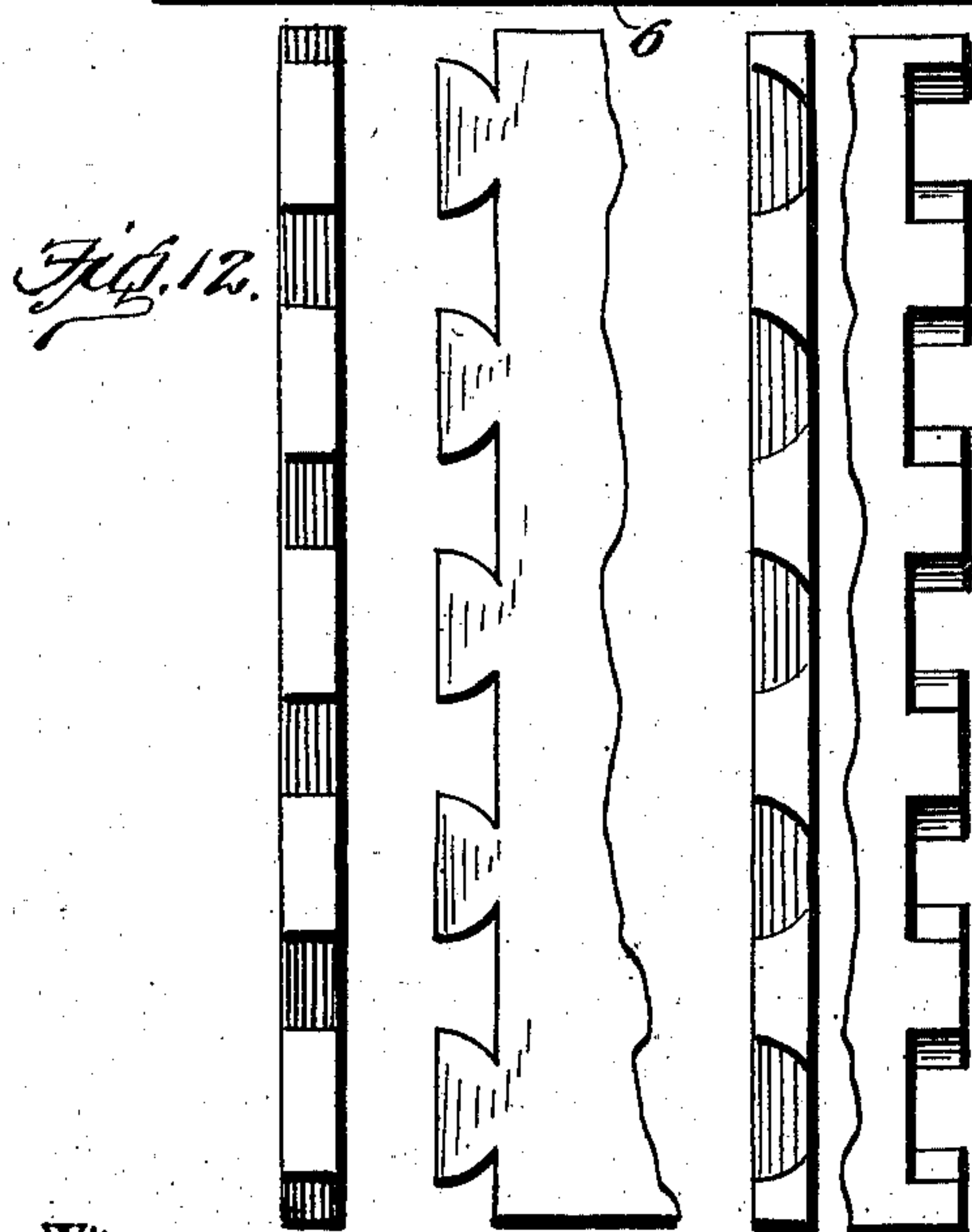


Fig. 12.

Fig. 13.

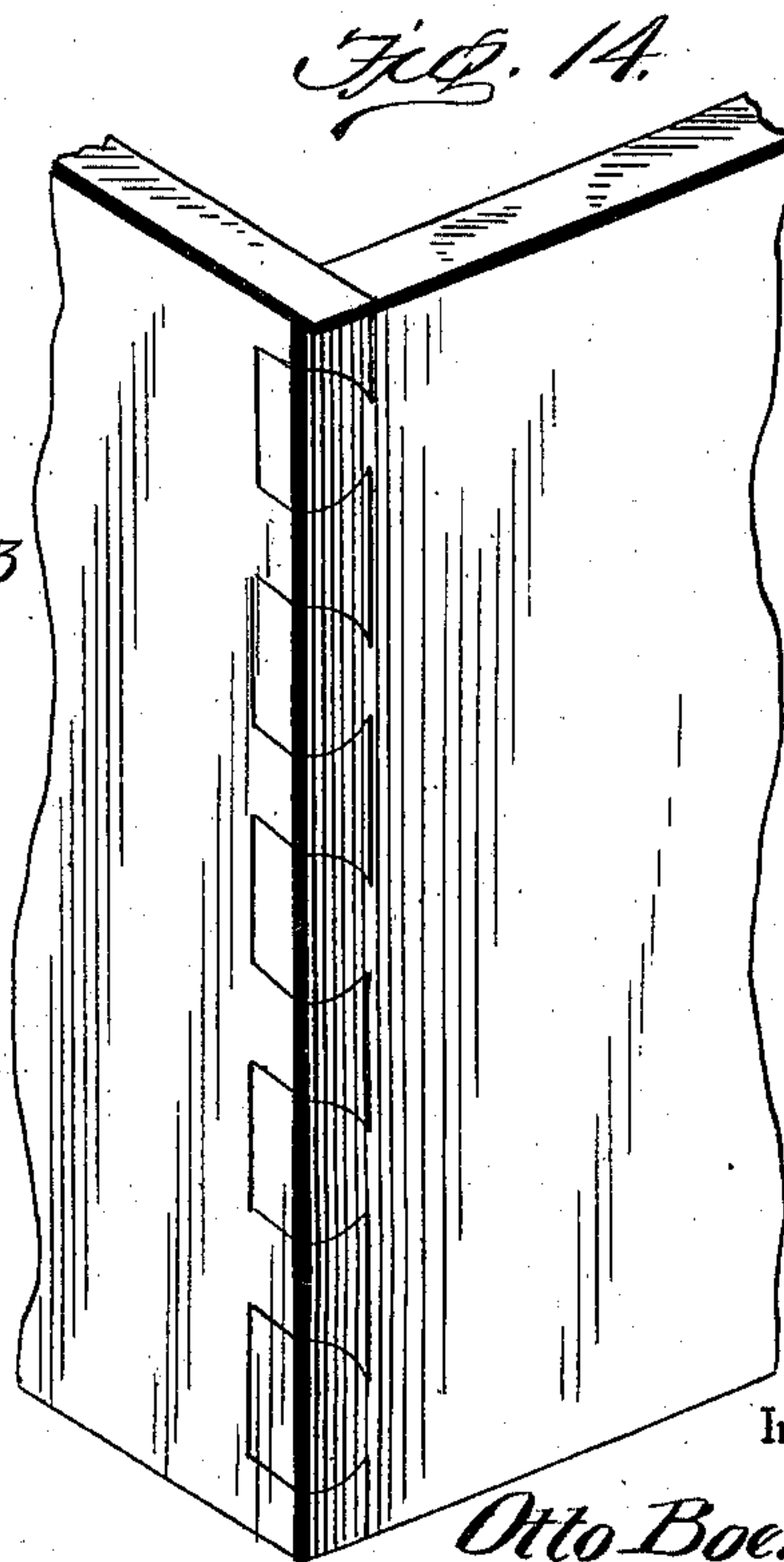


Fig. 14.

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UNITED STATES PATENT OFFICE.

OTTO BOEHM, OF BALTIMORE, MARYLAND.

GROOVING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 757,084, dated April 12, 1904.

Application filed June 25, 1903. Serial No. 163,078. (No model.)

To all whom it may concern:

Be it known that I, OTTO BOEHM, a citizen of the United States, residing at Baltimore, in the State of Maryland, have invented certain new and useful Improvements in Grooving-Machines; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to new and useful improvements in grooving-machines of that class designed for forming dovetailed grooves in the ends of boards or shooks which are to be dovetailed together to form boxes, frames, or the like.

The object of the invention is to provide a machine of this character which is simple in construction, durable in use, and very efficient in operation.

With this and other objects in view the invention consists of certain novel features of construction, combination, and arrangement of parts, as will be more fully described, and particularly pointed out in the appended claims.

In the drawings, Figure 1 is a top plan view of my grooving-machine. Fig. 2 is a front elevation of the same, parts being broken away to more clearly illustrate certain portions of the machine. Fig. 3 is an end elevation of the machine. Fig. 4 is a transverse vertical sectional view taken on the line 4 4 of Fig. 2 looking in the direction of the arrow and showing the parts adapted for cutting boards or shooks which are to form the ends of boxes. Fig. 5 is a similar sectional view looking in the opposite direction and showing the parts adapted for cutting the side boards or shooks of boxes. Fig. 6 is a detail horizontal sectional view taken on the line 6 6 of Fig. 2. Figs. 7 and 8 are respectively side and end elevations of one of the tools used for cutting the grooves in boards which are to form the ends of boxes. Figs. 9 and 10 are similar views of one of the tools used for cutting the grooves in side boards of boxes. Fig. 11 is a detail view of the bell-crank lever for regulating the depth of the grooves cut in the side boards of boxes. Fig. 12 is a side and an end view of a portion of a board which is

to form the end of a box. Fig. 13 is a side and an end view of a portion of a board which is to form the side of a box. Fig. 14 is a perspective view of one corner of a box, showing the lock-joint formed when the boards cut or grooved upon my machine are dovetailed together.

Referring more particularly to the drawings, the numeral 1 denotes the main frame, which may be of any desired construction, but which preferably consists of two sides 2, having their ends united by cross bars or braces 3. The upper and lower rails 4 and 5 of each of the sides are strengthened at their center by vertical braces 6, and the upper rail 4 of each side is provided upon its inner face with a longitudinal groove 7.

Secured upon the top of the upper rails 4, at the center of the same, are two transversely-disposed guide-bars 8, between which a transversely-disposed work-supporting carriage or table 9 is adapted to reciprocate. This carriage, upon which the boards or shooks to be grooved are clamped, is in the form of an open rectangular frame consisting of two side bars 10, having their ends suitably connected and their oppositely-disposed inner faces formed with rack-teeth 11. Upon the rear end of the carriage is a fixed upright 12, to which a horizontal cross-bar 13 is secured. A similar upright 12^a is slidably mounted upon the forward or front end of the carriage and is provided with a cross-bar 13^a, similar to the bar 13. Secured to said bars 13 and 13^a are two pairs of clamping-jaws 15 15^a and 16 16^a, between which the boards or shooks to be grooved are clamped. Said jaws are adjustably secured to the cross-bars by providing longitudinal slots 14^a in the latter and passing screws 14 through said slots and into the jaws. In order to clamp any desired number of boards between said jaws, the jaws 16 16^a are adjusted toward and from the jaws 15 15^a by providing a screw-rod 17, which extends lengthwise of the carriage and operates in a threaded aperture in the sliding upright 12^a. Said screw-rod 17 passes through and is swiveled in a fixed upright 18 upon the front end of the carriage. A pinion 19 upon the forward end of the screw-rod is in mesh with a gear 20 upon a stub-shaft journaled in the up-

per portion of said upright 18. A hand-wheel 21 is secured to said stub-shaft, so that upon the rotation of the same the screw-rod 17 will be operated to move the jaws 16 16^a toward
5 or from the jaws 15 15^a.

Upon each side of the work-supporting carriage 9 is an adjustable sliding carriage 22, upon which rotary cutting-tools are mounted. Each of these tool-carriages comprises a horizontal base-plate 23, three pairs of vertical
10 uprights 24 24^a 24^b upon the upper surface of said plate and two depending hangers 25 upon the bottom of said plate. The sides of the plates 23 are formed with ribs or tongues
15 26, which engage and slide in the grooves 7 in the upper rails 4 of the sides of the frame. The inner end of each of the carriages 22 is provided with a transversely-disposed track-rail 27, upon which the lower forked ends 28
20 of the clamping-jaws 15 15^a and 16 16^a are adapted to slide as the work-supporting carriage 9 is reciprocated.

In order to permit the boards or shooks upon the work-supporting carriage to be
25 alined and squared, I provide upon one of the carriages adjustable brackets 23^a, in which a transversely-disposed guide-rod 23^b is adjustably secured. When the boards or shooks are placed upon the carriage, their ends are
30 forced up against said rod, which acts as a stop to permit the ends of the boards to be properly alined.

Journalled in the pair of uprights 24 upon each of the carriages 22 is a vertical series of
35 spindles 29, the inner ends of which are formed with sockets 30, in which the shanks of suitable cutting-tools are secured by means of a set-screw. Secured to each of said spindles between the uprights 24 is a pinion 31. These
40 pinions upon each adjacent spindle are offset, so that upon each alternate spindle they will be in the same plane. This arrangement permits any two adjacent pinions in the same plane to mesh with gears 32, which are se-
45 cured upon shafts 33, journalled in the pair of uprights 24^a. Pinions 34, secured to said shafts 33, are in mesh with gears 35, secured upon shafts 36, journalled in the pair of up-
50 rights 24^b. The gears 35 are adapted to be connected or geared together by a small gear or pinion 37, which is journalled in an adjustable lever or arm 38. Said lever 38 has its
upper end pivoted to a cross-bar connecting said uprights and has its lower end adjust-
55 ably connected to one of the uprights by a pivoted screw-rod 39. The free end of the screw 39 passes through an aperture in the lever, and a lock-nut 40 is provided upon each side of the same to lock said lever in the de-
60 sired position. By this construction the upper gear 35 may be disconnected, as shown by the dotted lines in Fig. 4, to throw the four upper spindles out of operation when it is desired to cut a smaller number of grooves in
65 the ends of the boards. It will be understood

that these groups of gears may be repeated and any desired number of tool-spindles may be used.

Upon the outer end of the lower shaft 36 is secured a gear 41, which meshes with a gear 70 42, secured upon a shaft 43, journalled in bearings upon the plate 23 of the carriage. A pinion 44 upon said shaft 43 meshes with a gear 45, secured upon a shaft 46, which is
75 journalled in bearings formed in the hangers 25, depending from the bottom of the plate 23. Secured to the shaft 46 is a broad-face gear 47, which is adapted to mesh with a gear 48 upon a central longitudinal drive-shaft 49. This shaft is journalled in suitable bearings 80 upon the cross-bars 3 at the ends of the frame and is provided at one end with a band-wheel or pulley 50, which is adapted to be connected to a suitable power-shaft by a belt or band. (Not illustrated.) The rotation of this shaft 85 49 will impart motion to the series of cutting-tools upon each of the carriages 22 by means of the intermediate gearing just described. It will be seen that the gearing is so arranged that the tool-spindles upon both carriages will 90 be rotated in the same direction and the tools upon the two carriages will have their cutting edges reversed, as will be readily understood.

In order to adjust the tool-carriages 22 to- 95 ward and from the work-supporting carriage 9, I provide oppositely-screw-threaded rods 51, which pass through threaded apertures in the depending hangers 25. The inner ends of these screw-rods 51 have a swiveled connec- 100 tion in brackets upon the braces 6 and are provided with beveled pinions 52, which mesh with a beveled gear 53, secured upon one end of a shaft 54. Said shaft 54 is journalled in bearings secured to the vertical braces 6 and 105 is provided upon its outer end with a hand-wheel 55. The rotation of this wheel 55 will cause the screw-rods 51 to turn, and the carriages will thereby be moved toward or from each other and the work-supporting-car- 110 riage 9.

In order to reciprocate the work-supporting carriage or table, and thus move the work which is clamped between the jaws 15 15^a and 16 16^a across the faces of the cutting-tools, I 115 provide a drive pinion or gear 56, which is adapted to be moved into mesh with either of the racks 11 of the carriage 9. Said gear 56 is journalled upon the upper end of a vertical swinging shaft 57, the lower end of which is 120 journalled in a bearing 58, pivoted to a block secured to the lower rail 5 of the frame. The upper portion of said shaft 57 is journalled in a bearing 59, which has a sliding engagement with a guide 60, secured to the vertical braces 125 6. The bearing 59 is moved to throw the pinion into engagement with either rack by means of the hand-lever 61, which is pivoted upon a bracket secured to one of the braces 6 and has its inner end loosely connected to said 130

bearing 59. Adjacent to the lower end of the shaft 57 is secured a beveled gear 62, which meshes with a similar gear 63, secured upon a horizontal shaft 64, journaled in bearings 65. A gear 66 upon the shaft 64 meshes with a gear 67, which is adjustably secured to the main drive-shaft 49 by the set-screw 68. Upon the rotation of the drive-shaft motion will be imparted to the vertical shaft 57, and the rotation of the pinion 56 will move the carriage 9 either forwardly or rearwardly, according to which of the two rack-bars 11 said gear is engaged with.

When it is desired to cut or groove the ends of boards or shooks which are to form the ends of boxes, cutting-tools 69, such as are illustrated in Figs. 7 and 8 of the drawings, are inserted in the sockets of the tool-spindles 29. These tools have a flaring or conical-shaped cutting end consisting of four curved cutting edges 70, formed upon a stem or shank 71. These flaring cutting edges are adapted to groove the ends of the boards or shooks, as shown in Fig. 12 of the drawings.

The operation of the machine when the end boards of the boxes are grooved is as follows: The work-supporting carriage being in its extreme forward position, the desired number of boards or shooks are placed upon the same with their ends abutting against the stop 23^b and clamped between the jaws 15 15^a and 16 16^a by operating the hand-wheel 21. Motion is then imparted to the drive-shaft 49, which will in turn impart motion to the tool-spindles upon each of the tool-carriages through the connecting-gearing previously described. The motion of the drive-shaft 49 will also be imparted to the vertical shaft 57 and its pinion 56 to move the carriage 9, so as to draw the boards or shooks or other work upon the same across the cutting-tools upon the carriages. After the work has been moved past the cutting-tools the hand-lever 61 is shifted to move the pinion 57 into mesh with the opposite rack 11 in order to return the carriage to its forward position. When this lever is in its central position, the pinion 57 will not be engaged with either rack 11 and the carriage will remain stationary. When the carriage is in its forward position, the finished or grooved boards may be removed and replaced by uncut boards, and the operation previously described is repeated. Should it be desired to cut the grooves in the end boards to a greater or less depth, the screws 14 are first loosened to permit them to slide in the slots 14^a in the cross-bars 13 13^a, and the hand-wheel 55 is then operated to move the tool-carriages 22 to the desired position. The screws 14 are then tightened to clamp the jaws 15 15^a and 16 16^a to the cross-bars 13 13^a, and the brackets 23^a are also adjusted so that the boards may be properly centered between the cutting-tools.

When it is desired to cut the grooves in the

ends of boards or shooks which are to form the sides of the boxes, I make certain changes in the machine, owing to the nature of the grooves or cuts to be made. These grooves are illustrated in Fig. 13 of the drawings, and it will be noticed that the side boards must be cut one at a time—that is, a plurality of boards for the sides of the boxes cannot be cut at the same time. To this end the clamping-jaws 15 15^a and 16 16^a are removed, and the larger but similar jaws 15^c 15^c and 16^c 16^c are substituted therefor, as shown in Fig. 5 of the drawings. The substitution of these jaws leaves but a narrow space between them, which is just sufficient to receive one board, said board being inserted and removed, as previously described.

Instead of using the rack-and-pinion feed for reciprocating the work-supporting carriage I provide an automatic feed by connecting a depending bracket 73 with a pivoted bell-crank lever 74, as shown in Fig. 5. The bracket 73 is removable and is only inserted in the opening 73^a in the forward end of the carriage 9 when it is desired to cut the sides of boxes. Screws 73^b, passing through apertures in the enlarged head of said bracket, fasten the same to the carriage. The bell-crank lever 74 is pivoted at 75 to one of the braces 6 and has one of its arms 76^a adjustable, as shown in Fig. 11, to permit the movement of the carriage to be regulated, and hence to vary the size of the cut or groove, as hereinafter explained. The adjustable portion 76^a of this arm has its lower end pivoted to the rigid portion 76^b and has its upper portion connected to the same by a screw 76^c. Said screw is pivoted to the portion 76^a and passes through an elongated aperture in the portion 76^b. A binding-nut 76^d upon said screw limits the separation of said portions of the arm. A screw 76^e, operating in a threaded aperture in the portion 76^b, impinges upon the portion 76^a to hold said portions of the arm rigid. By operating the nut 76^d and the screw 76^e it will be seen that said arm may be adjusted to vary its angle with respect to the fixed arm 77 of the bell-crank lever. The upper end of the portion 76^a is provided with an elongated aperture, through which a pin 78 is passed to attach the lever to the bracket 73.

The arm 77 of the bell-crank lever is connected by a link 79 to a lever 80, which is pivoted at 81 to the braces 6 of the main frame. The free end of this lever is forked or bifurcated, as shown at 81', and the arms of the same are provided with friction-rollers 82, which are adapted to engage a cam-wheel 83, secured upon a horizontal shaft 84. Said shaft 84 is suitably journaled in bearings secured to the braces 6 and is provided with a fixed gear 85. The gear 67, which is secured to the main drive-shaft 49 by the set-screw 68 and which meshes with the gear 66 when the rack-and-pinion feed is used, is adapted to be

moved out of engagement with the gear 66
 and into mesh with the gear 85 when it is de-
 sired to use the automatic feed to cut the side
 boards or shooks. Movement is imparted to
 5 the shaft 84 from the main drive-shaft 49
 through these gears 67 and 85, and the rota-
 tion of the cam 83 will oscillate the lever 80,
 which in turn will oscillate the bell-crank le-
 ver 74 through the link 79 to reciprocate the
 10 carriage 9. The cam 83 is shaped so as to
 time the movement of the carriage and to per-
 mit the same to remain quiet in its forward
 position during the greater portion of the
 revolution of the cam in order to permit the
 15 operator to remove and insert the boards or
 shooks between the clamping-jaws of the
 work-supporting carriage. By adjusting the
 arm 76^a of the bell-crank lever the degree of
 reciprocation of the carriage may be regulated
 20 to vary the size of the cut or groove made by
 the tools.

In cutting the grooves in the ends of the
 side boards or shooks the cutting-tools pre-
 viously described are removed from the tool-
 25 spindles and those illustrated in Figs. 9 and
 10 of the drawings are inserted. These tools
 consist of a shank or tang 86, formed at one
 end with a head 87, having, preferably, six
 cutting edges or blades. These blades are
 30 slightly tapered longitudinally to cut a simi-
 lar-shaped groove, and thus enable the boards
 to be dovetailed together more easily. The
 end of the head 87 is formed with a transverse
 dovetailed groove 88, in which a flat plate 89
 35 is secured by a screw 90. The ends of this
 plate or blade are provided with fine teeth 91,
 which prevent tearing of the wood and per-
 mit a neat finished groove to be made.

The operation of the invention in cutting
 40 either the side or end boards or shooks will
 be readily understood upon reference to the
 foregoing description and the accompanying
 drawings, and it will be seen that I have pro-
 vided a simple, durable, and efficient machine.
 45 While I have illustrated and described eight
 cutting-tools mounted upon each carriage, it
 will be understood that any desired number
 may be employed, and any arrangement of
 gearing may be used to drive the same.

50 Various other changes in the form, propor-
 tion, and the minor details of construction
 may be resorted to without departing from
 the principle or sacrificing any of the advan-
 tages of this invention.

55 While I have described the tools illustrated
 in Figs. 7 and 8 of the drawings as being used
 for cutting grooves in the end boards of
 boxes, it will be understood that the grooves
 cut by these tools may be formed in either
 60 the side or end boards, and the same is true
 of the grooves cut by the tools illustrated in
 Figs. 9 and 10.

From the foregoing description, taken in

connection with the accompanying drawings,
 the construction and operation of the inven- 65
 tion will be readily understood without re-
 quiring a more extended explanation.

Having thus fully described my invention,
 what I claim, and desire to secure by Letters
 Patent, is—

1. In a machine of the character described,
 a series of tool-spindles provided with pin-
 ions, the pinions upon adjacent spindles be-
 ing offset so that the pinions of alternate
 spindles will lie in the same plane, and actu- 75
 ating-gears, each meshing with a plurality of
 adjacent pinions in the same plane.

2. In a machine of the character described,
 a series of tool-spindles provided with pin-
 ions, the pinions upon adjacent spindles be- 80
 ing offset so that the pinions of alternate
 spindles will lie in the same plane, a series
 of driving-shafts therefor, each of said driv-
 ing-shafts being provided with gears, each
 meshing with a plurality of adjacent pinions 85
 in the same plane, and with driving-pinions
 and gears for operating said driving-pinions,
 one of said operating-gears being adjustable
 so as to be thrown in and out of gear to vary
 the number of driven spindles, substantially 90
 as described.

3. In a grooving-machine, the combination
 of a suitable frame, transverse guides upon
 said frame, a work-supporting carriage mov-
 able along said guides and formed with oppo- 95
 sitely-disposed rack-bars, a main drive-shaft
 in said frame, an oscillating shaft, driving
 connections between said shafts, a pinion upon
 said oscillating shaft adapted to mesh with
 either of said rack-bars to reciprocate said 100
 carriage, means for shifting said pinion into
 engagement with either rack-bar, and tool-
 carriages upon said frame provided with suit-
 able cutting-tools, substantially as described.

4. In a grooving-machine, the combination 105
 of a suitable frame, guides upon said frame,
 a work-supporting carriage movable along said
 guides and provided with a depending bracket,
 a drive-shaft in said frame, a secondary shaft
 geared to said drive-shaft, a cam upon said 110
 secondary shaft, a pivoted lever actuated by
 said cam, a bell-crank lever connected to said
 bracket upon the carriage, a connection be-
 tween said lever and bell-crank lever, tool-
 carriages mounted upon said frame and pro- 115
 vided with a plurality of rotary cutting-tools,
 and means for driving said tools, substantially
 as described.

In testimony whereof I have hereunto set
 my hand in presence of two subscribing wit- 120
 nesses.

OTTO BOEHM.

Witnesses:

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 E. A. HENG.