No. 715,477. Patented Dec. 9, 1902.

C. A. HEGE.

MACHINE FOR CUTTING CROSS TIES.

(Application filed Mar. 15, 1902.)

(No Model.) 4 Sheets—Sheet I.

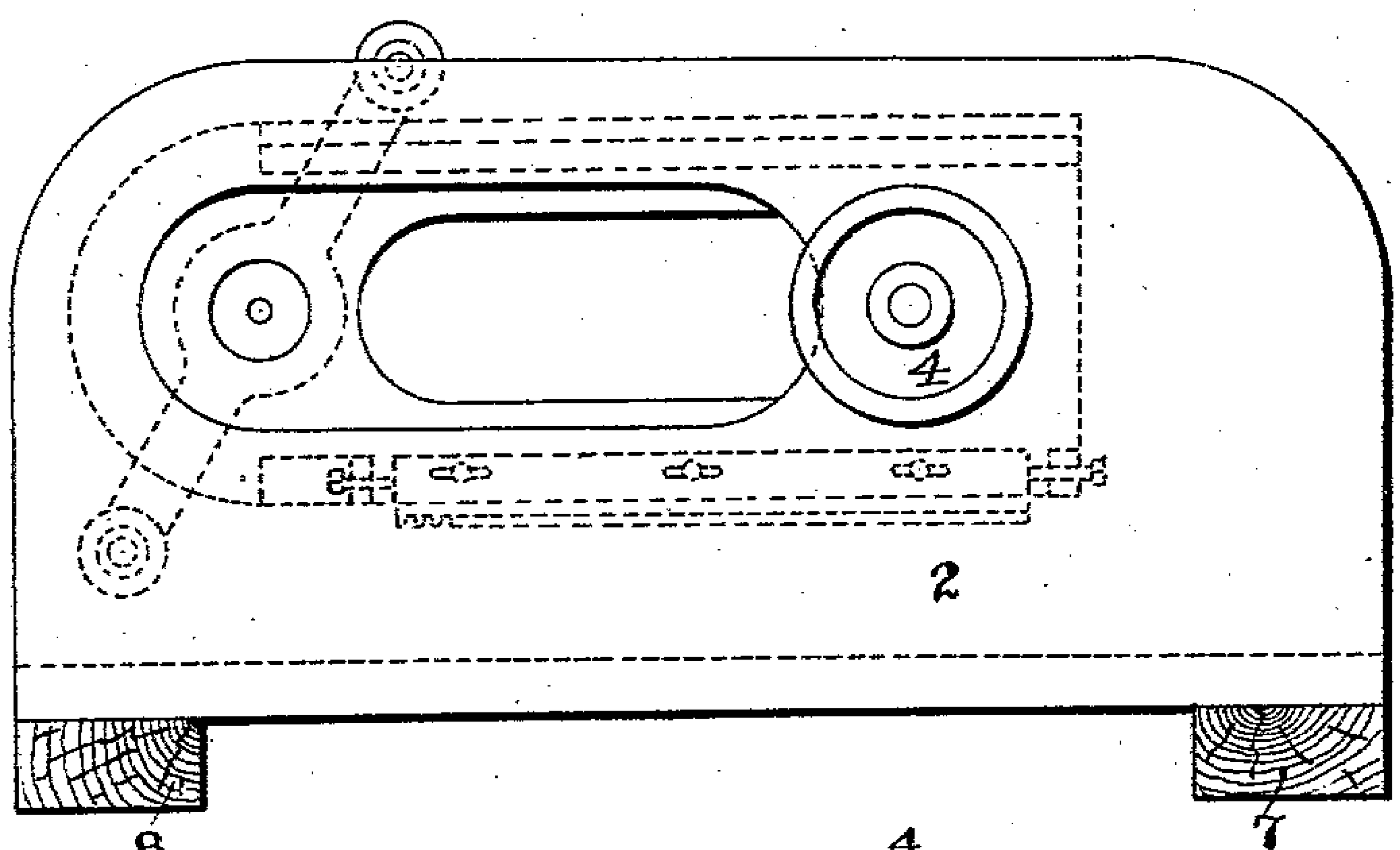

Fig. 2

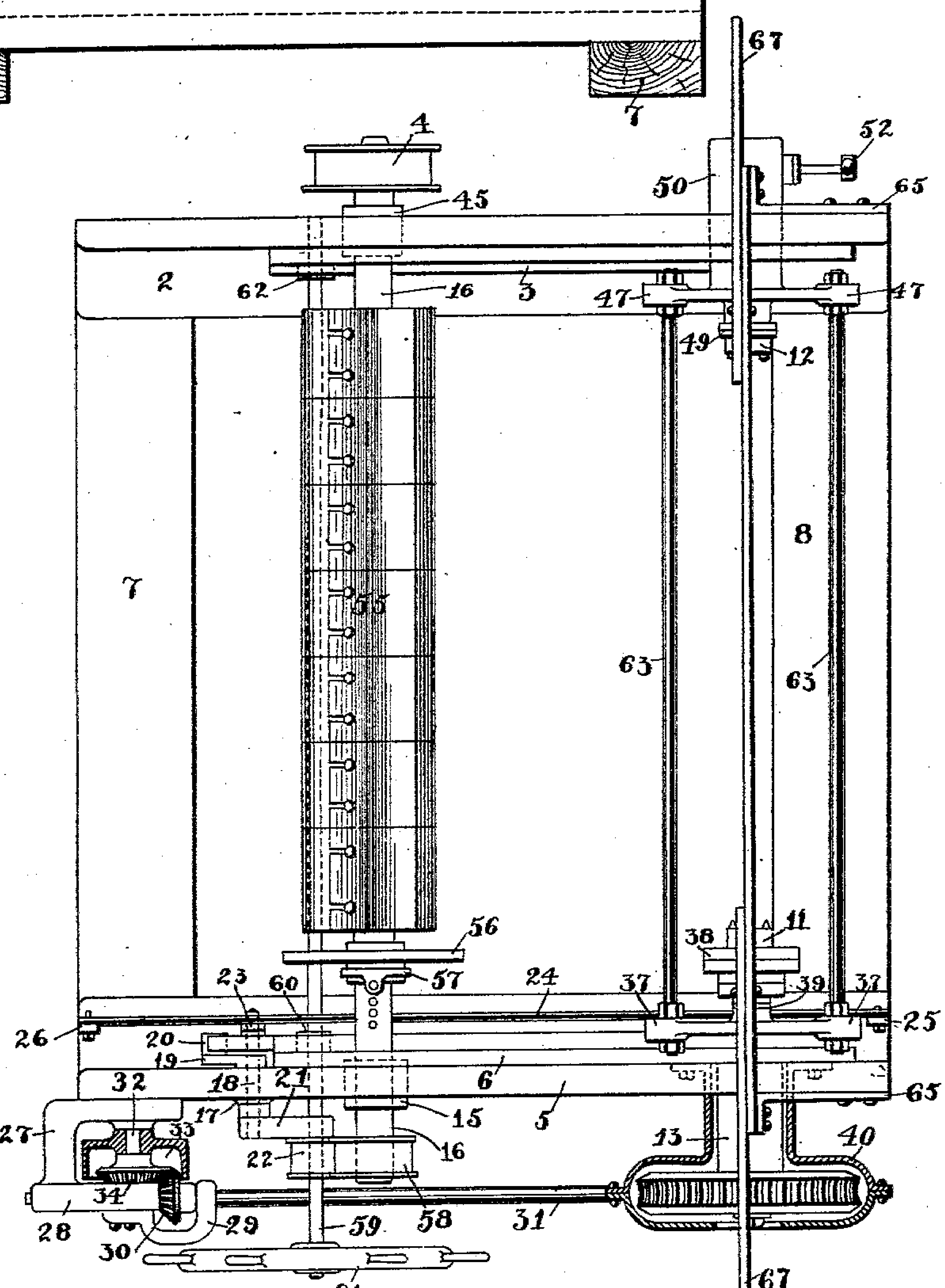

Fig. 1

Witnesses
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4 Sheets—Sheet 2.

Fig. 3

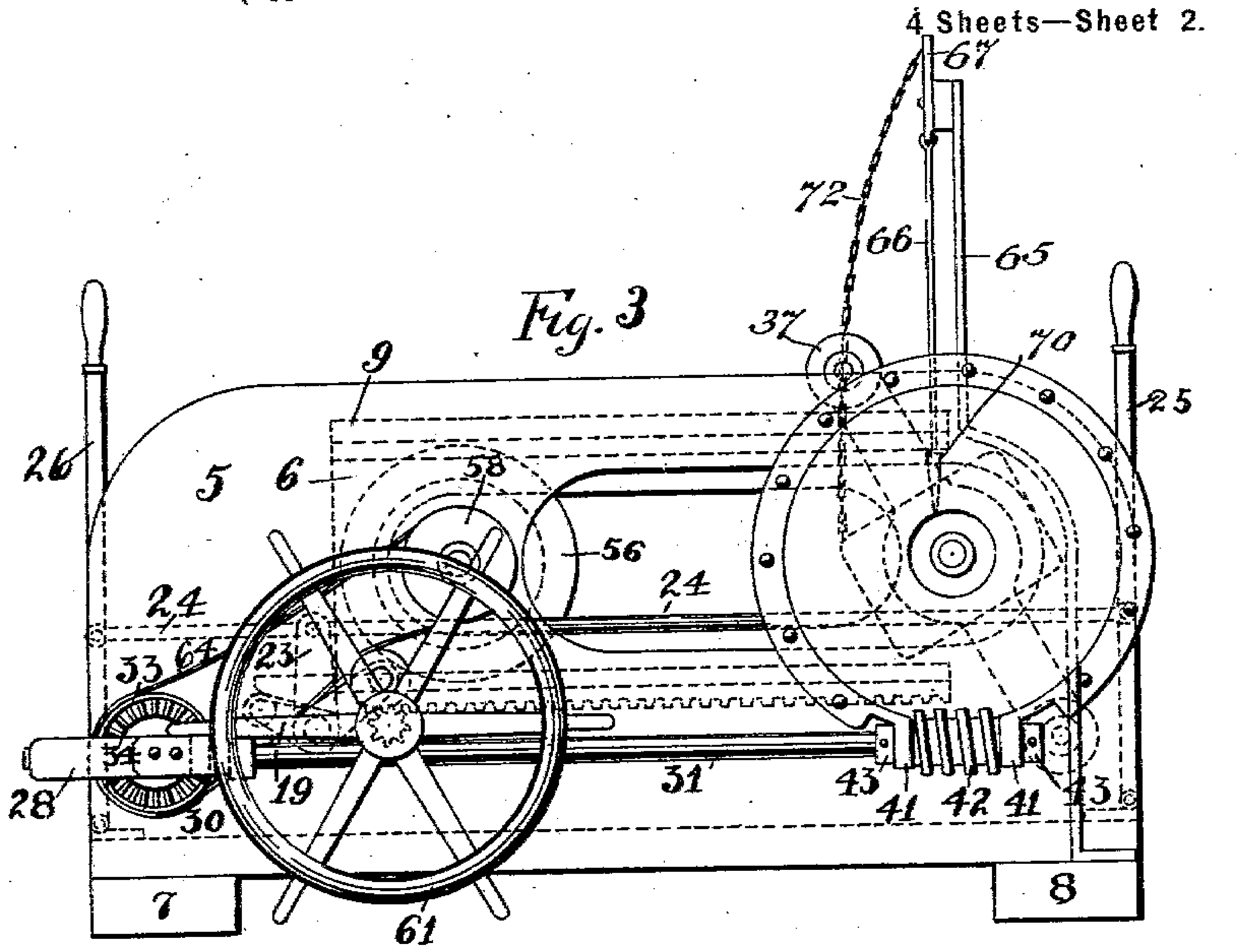


Fig. 5

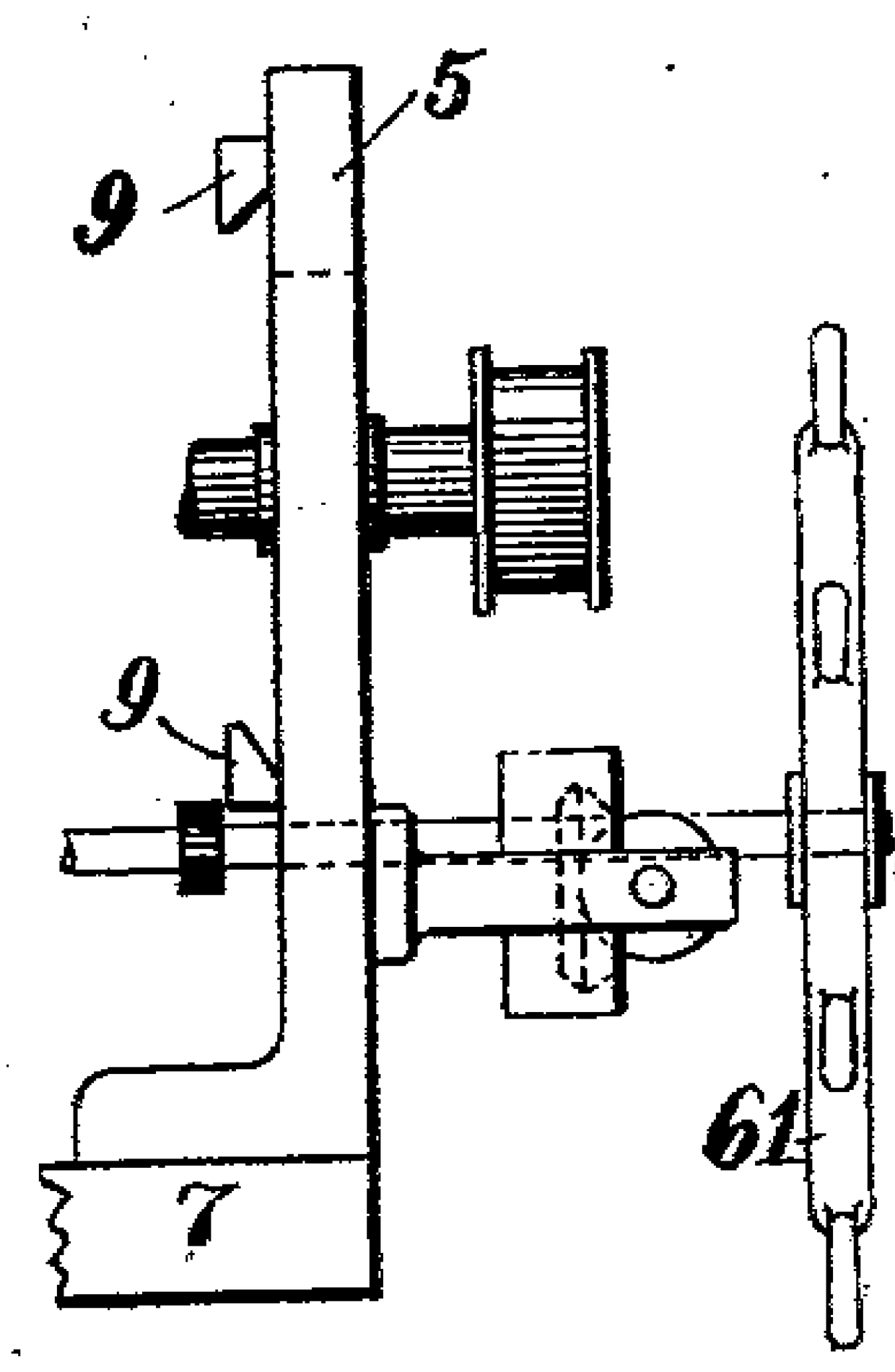
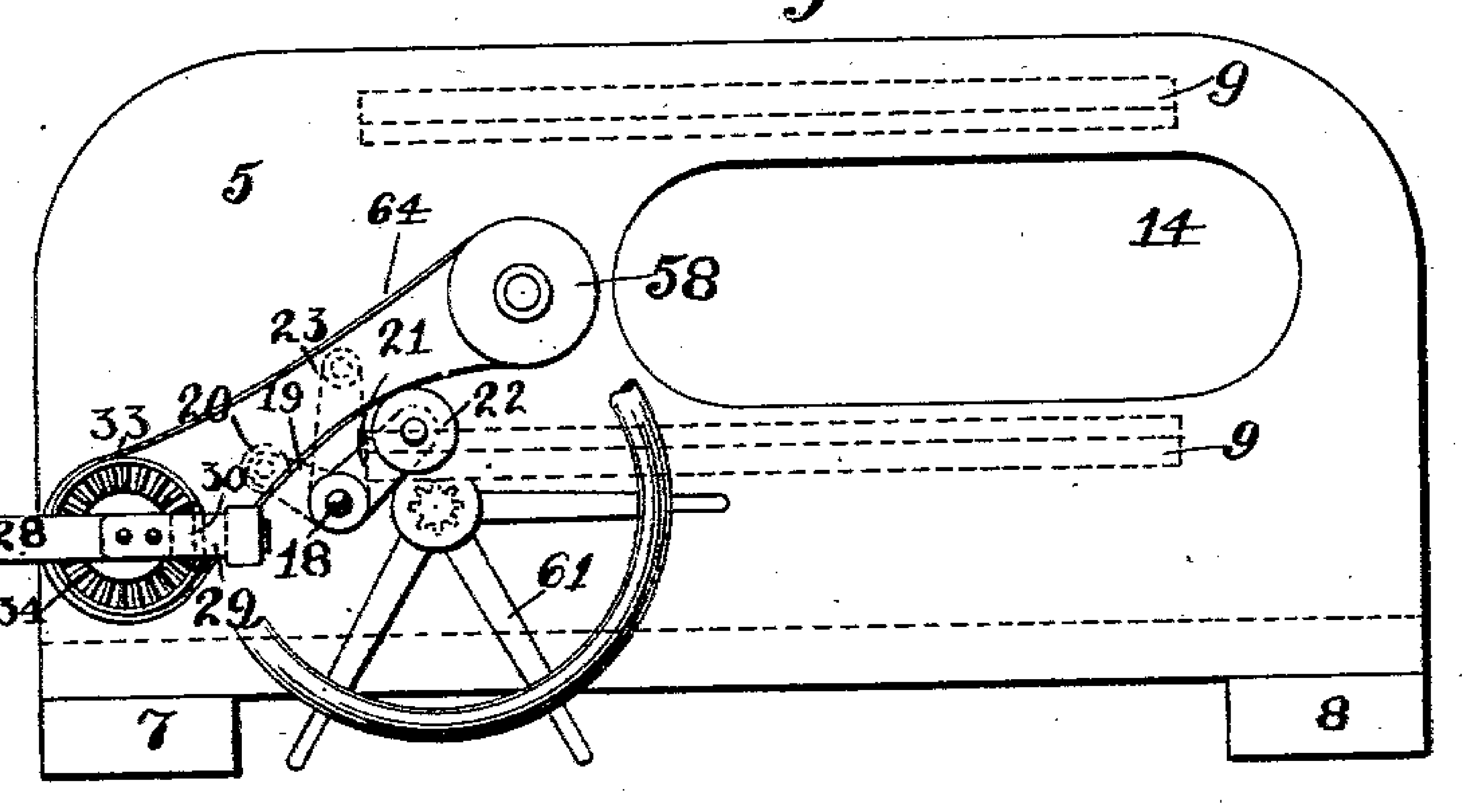


Fig. 4



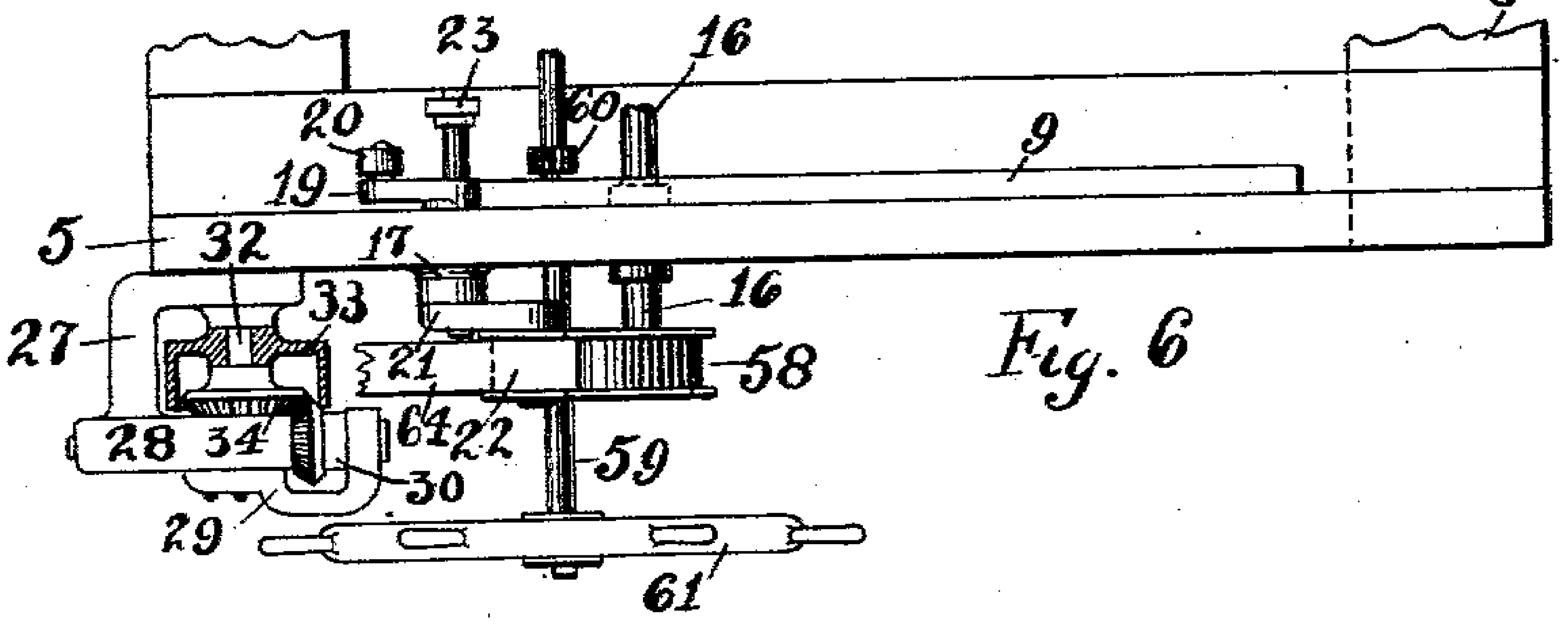


Fig. 6

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No. 715,477. Patented Dec. 9, 1902.

C. A. HEGE.

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(Application filed Mar. 15, 1902.)

(No Model.) 4 Sheets—Sheet 3.

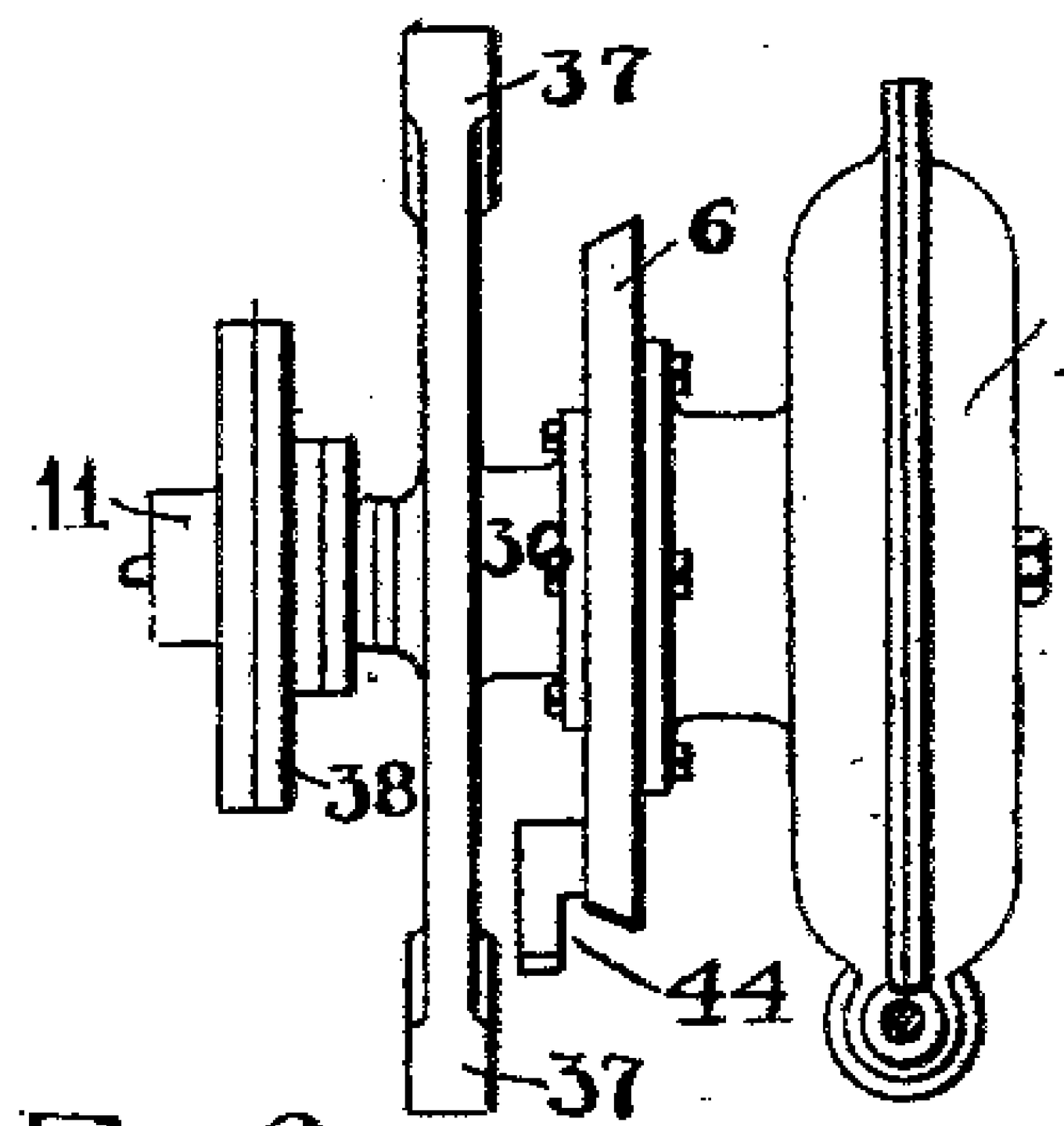
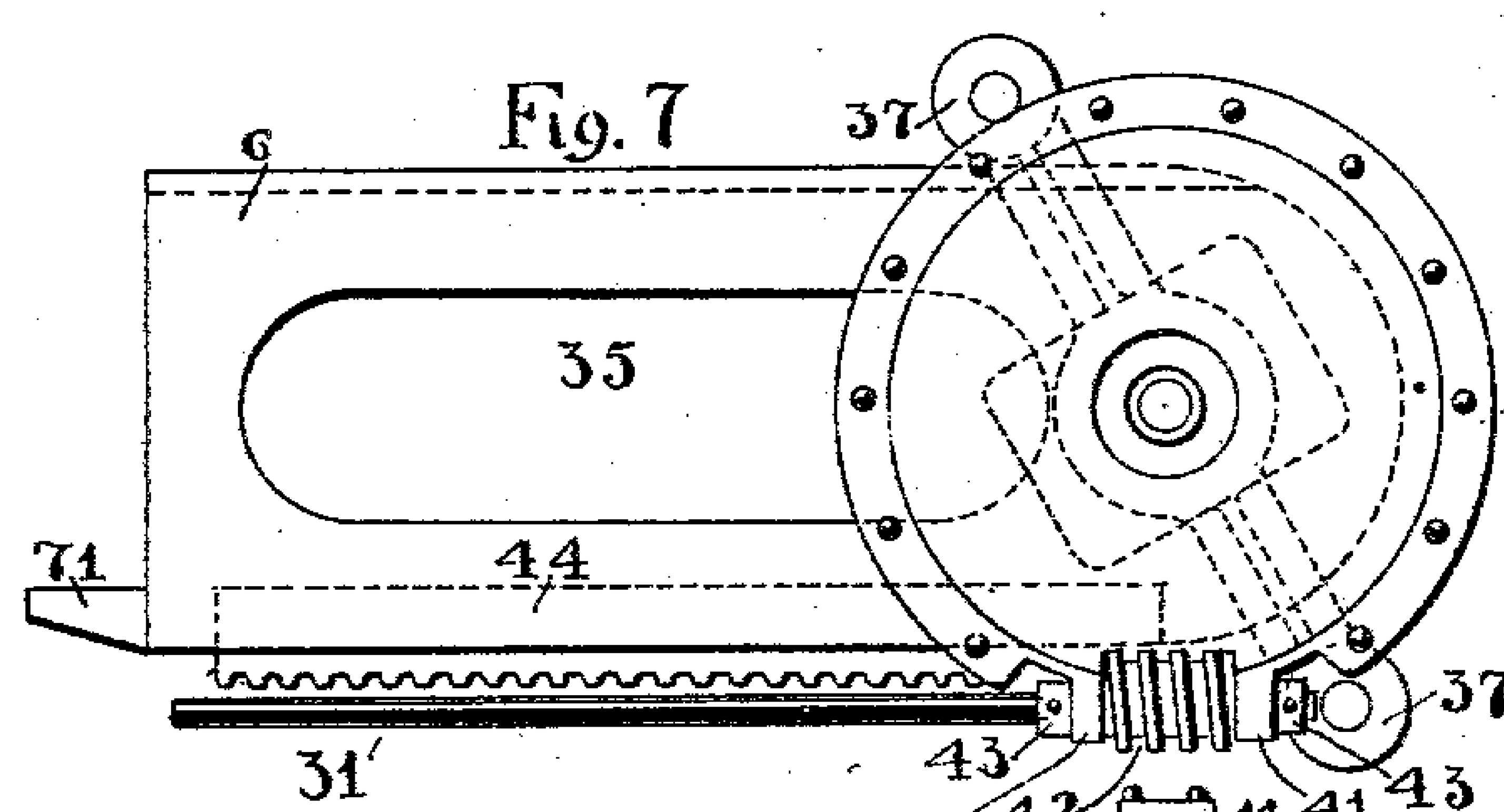


Fig. 8

Fig. 7



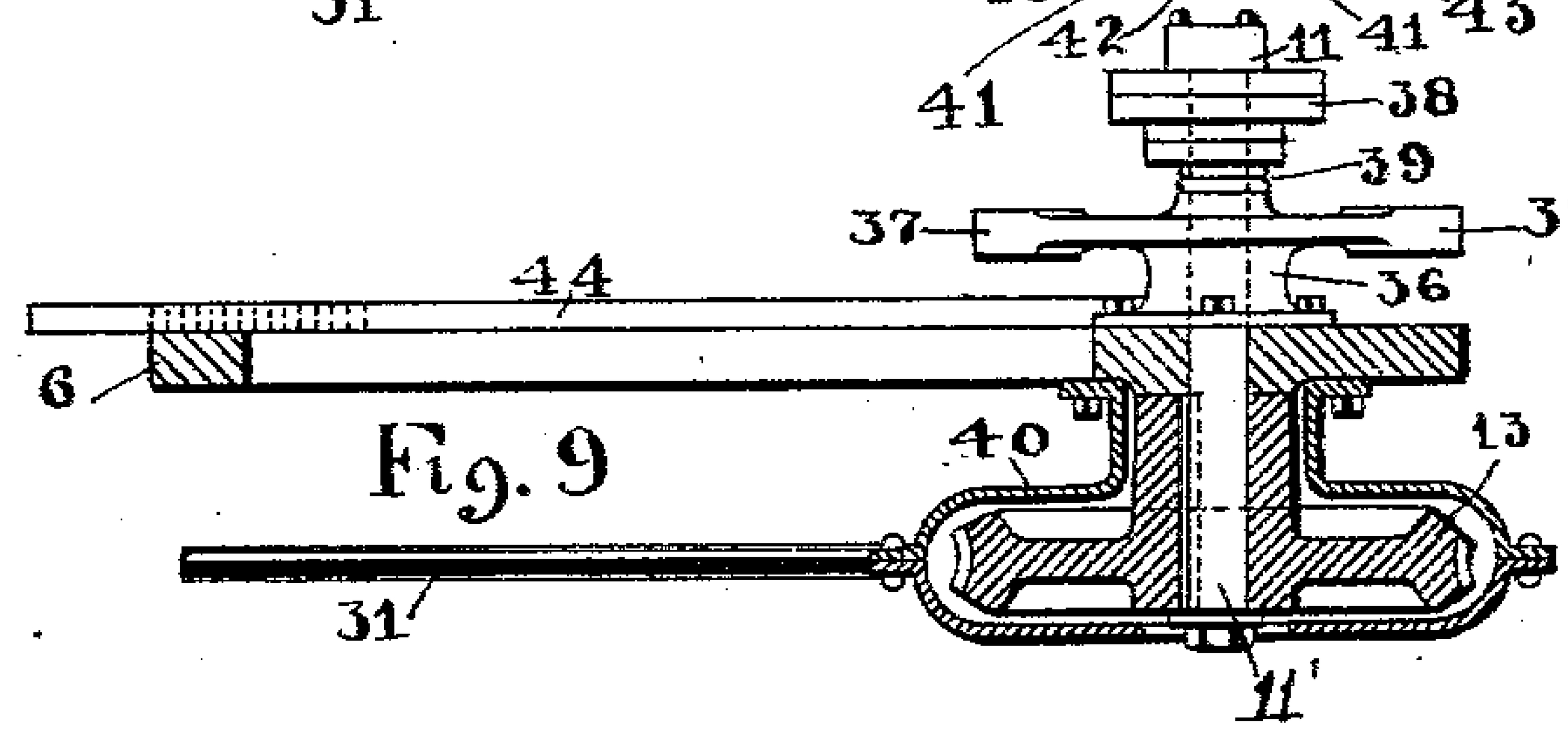


Fig. 9

Fig. 10

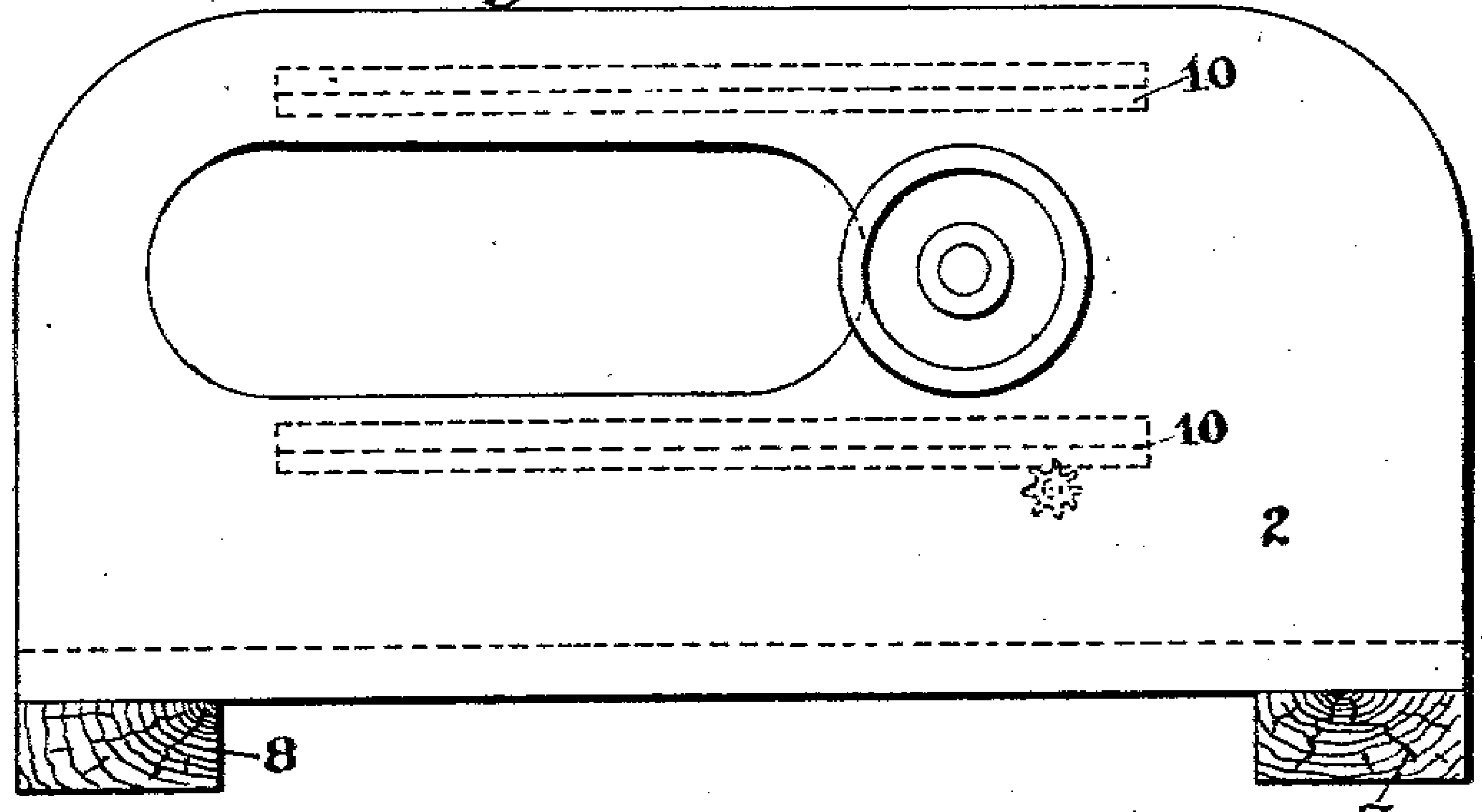
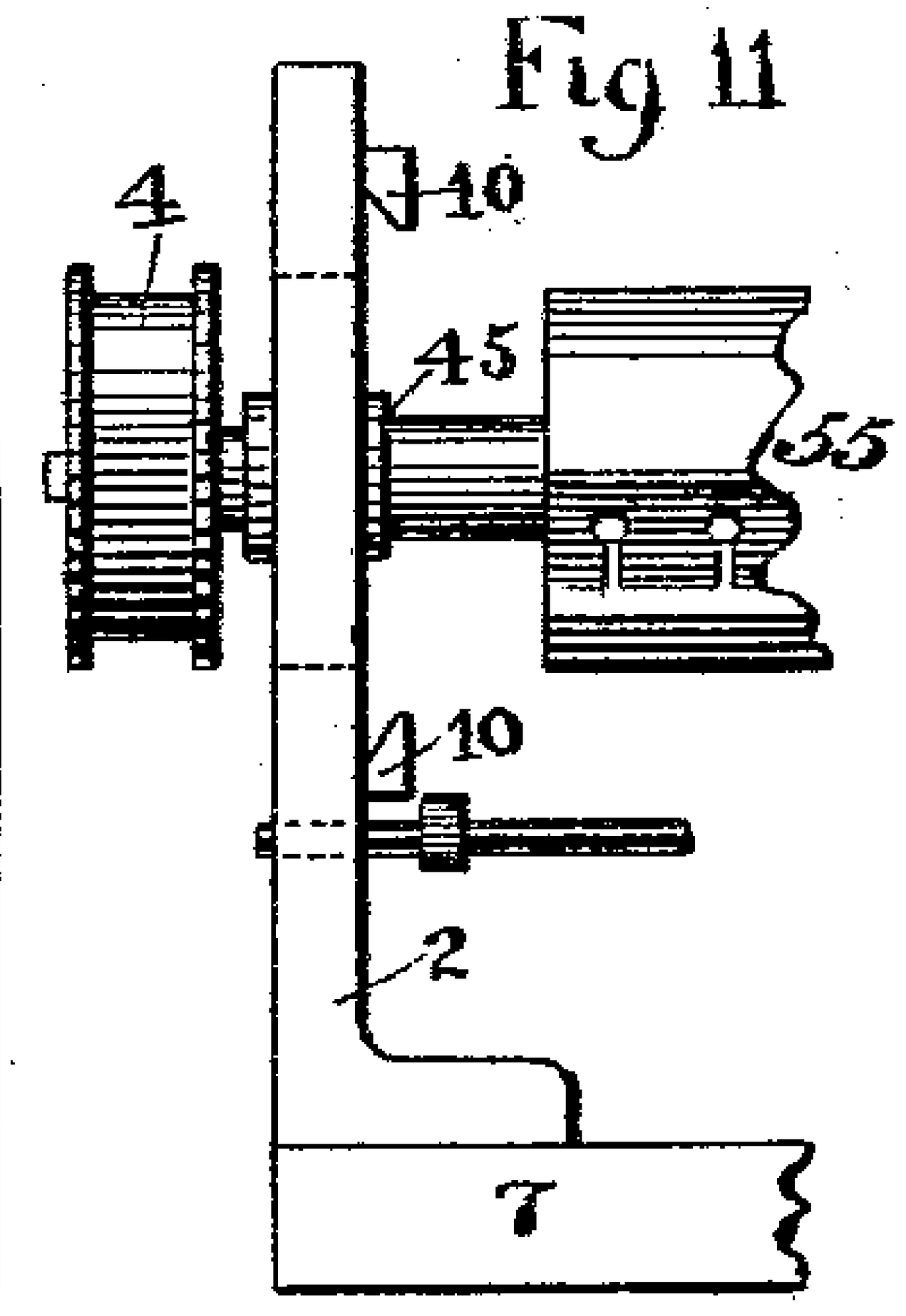


Fig 11



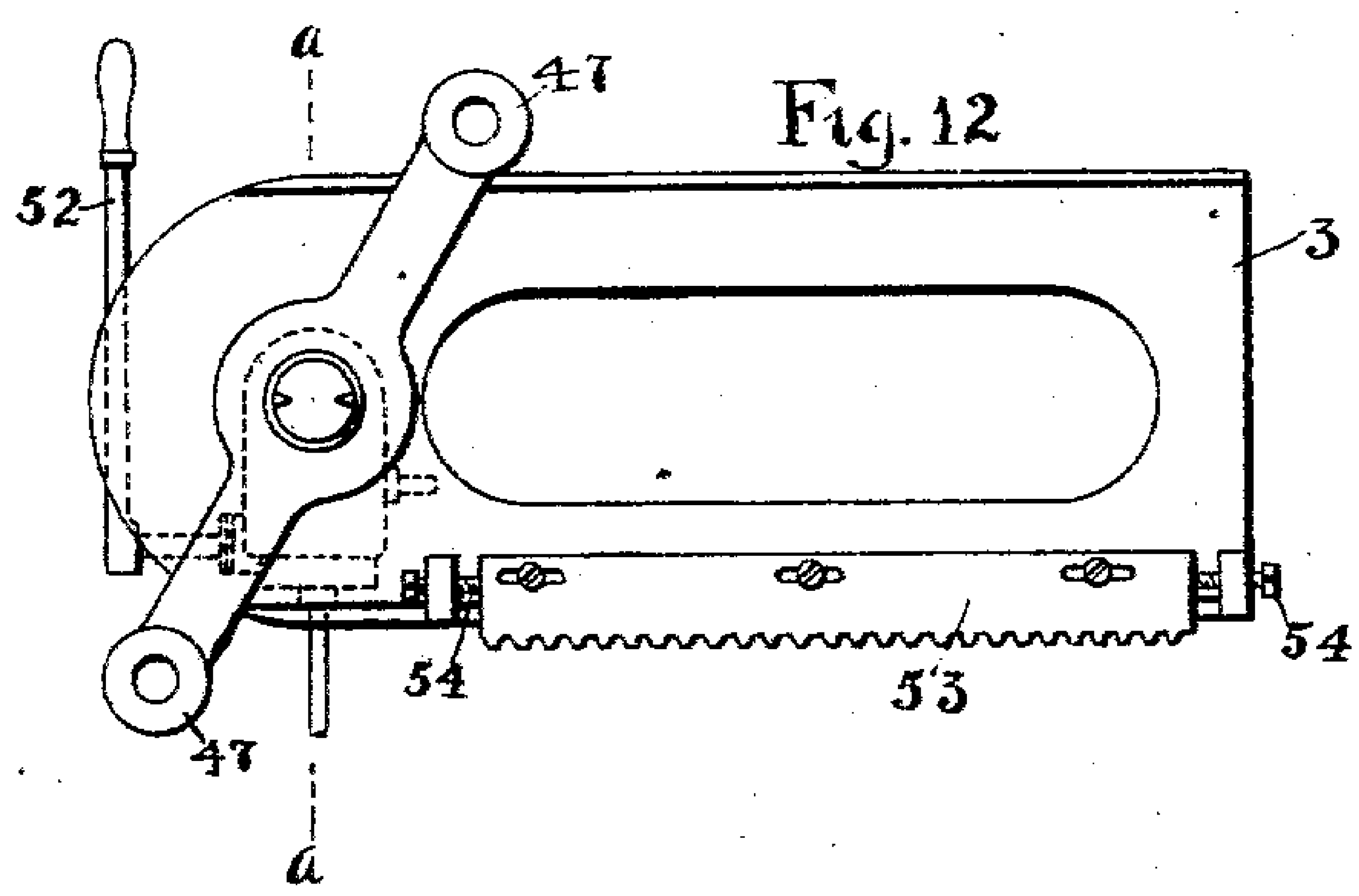
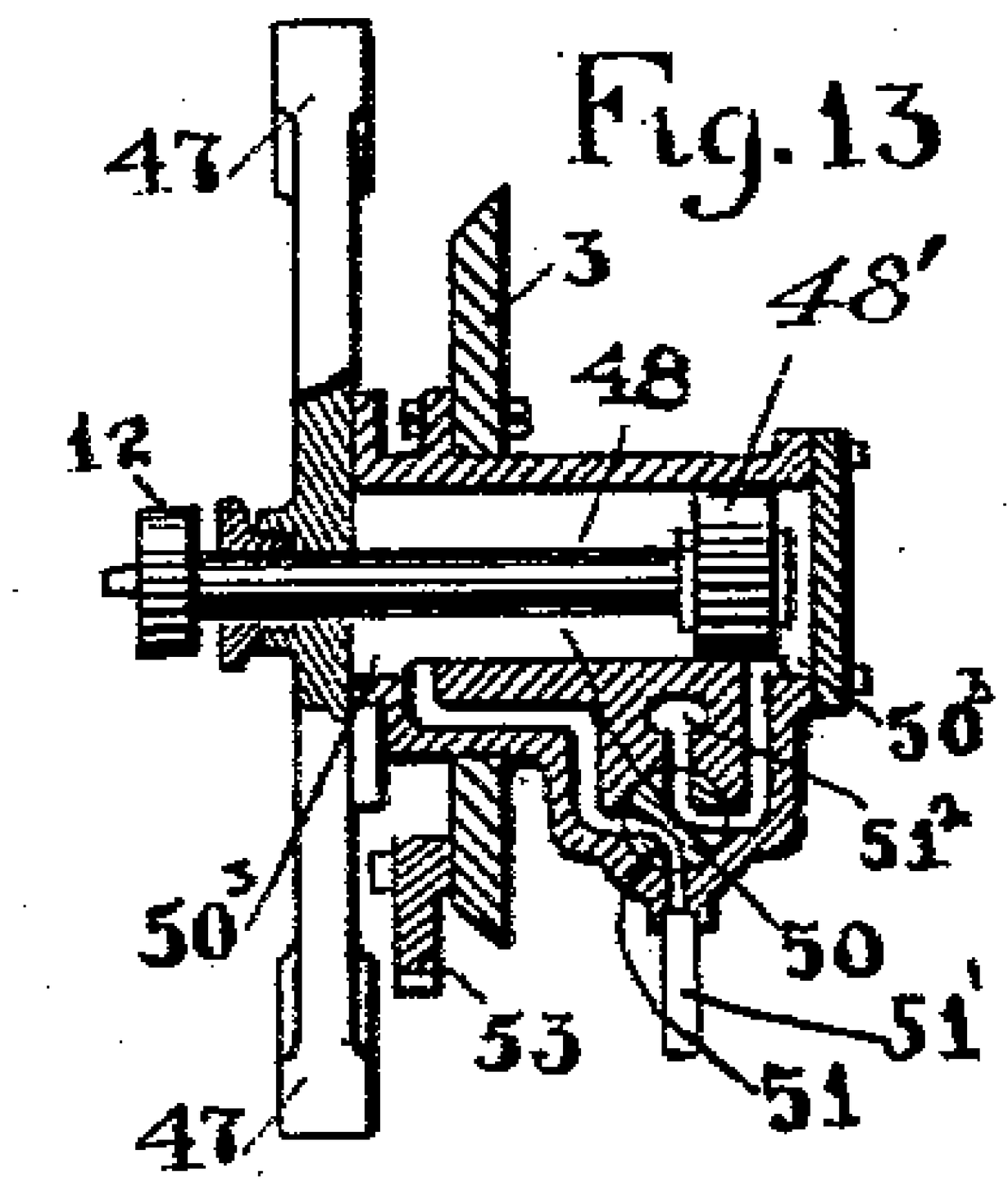


Fig. 12

Fig. 13



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MACHINE FOR CUTTING CROSS TIES.

(Application filed Mar. 15, 1902.)

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Fig 16

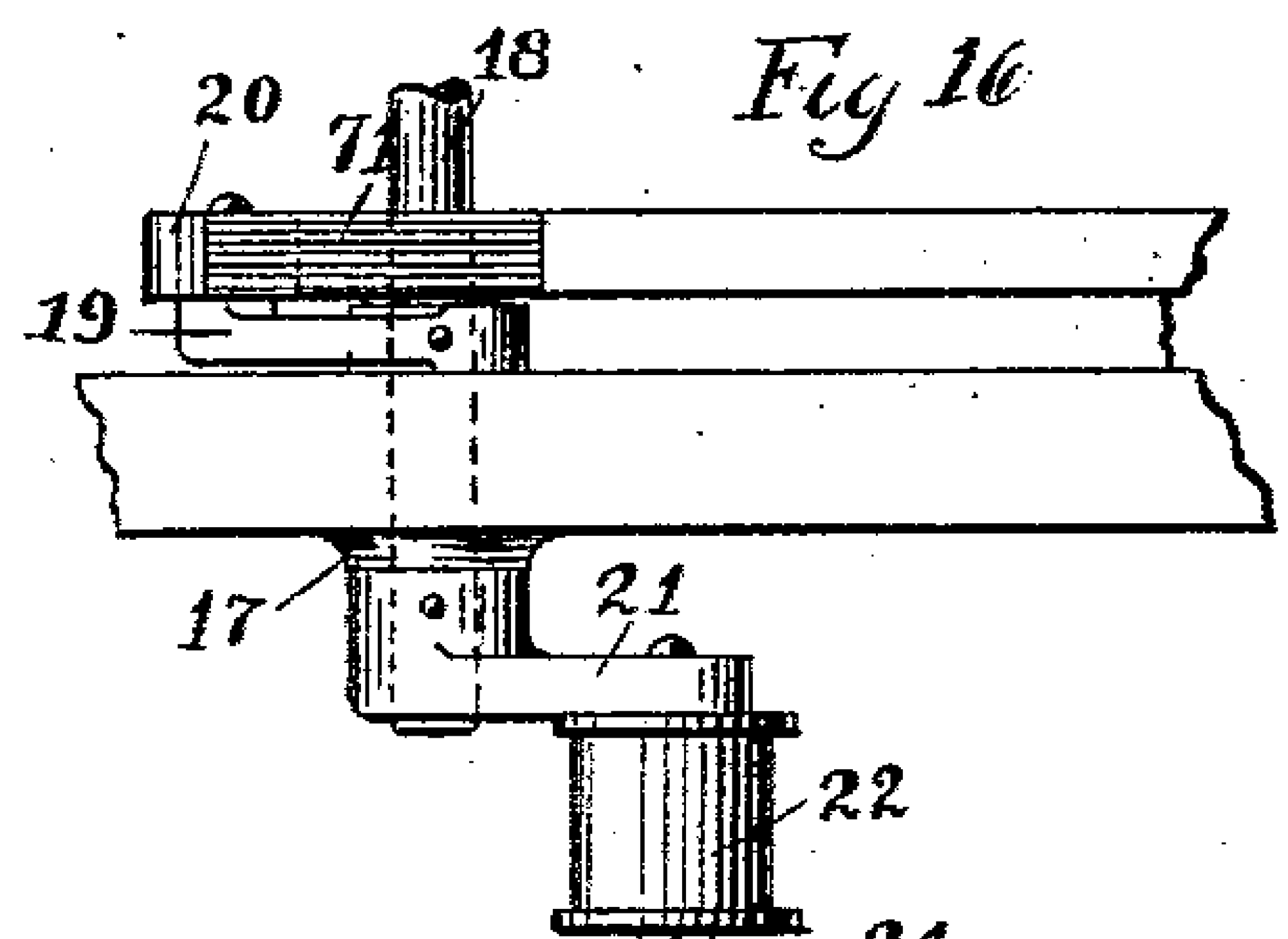


Fig. 19

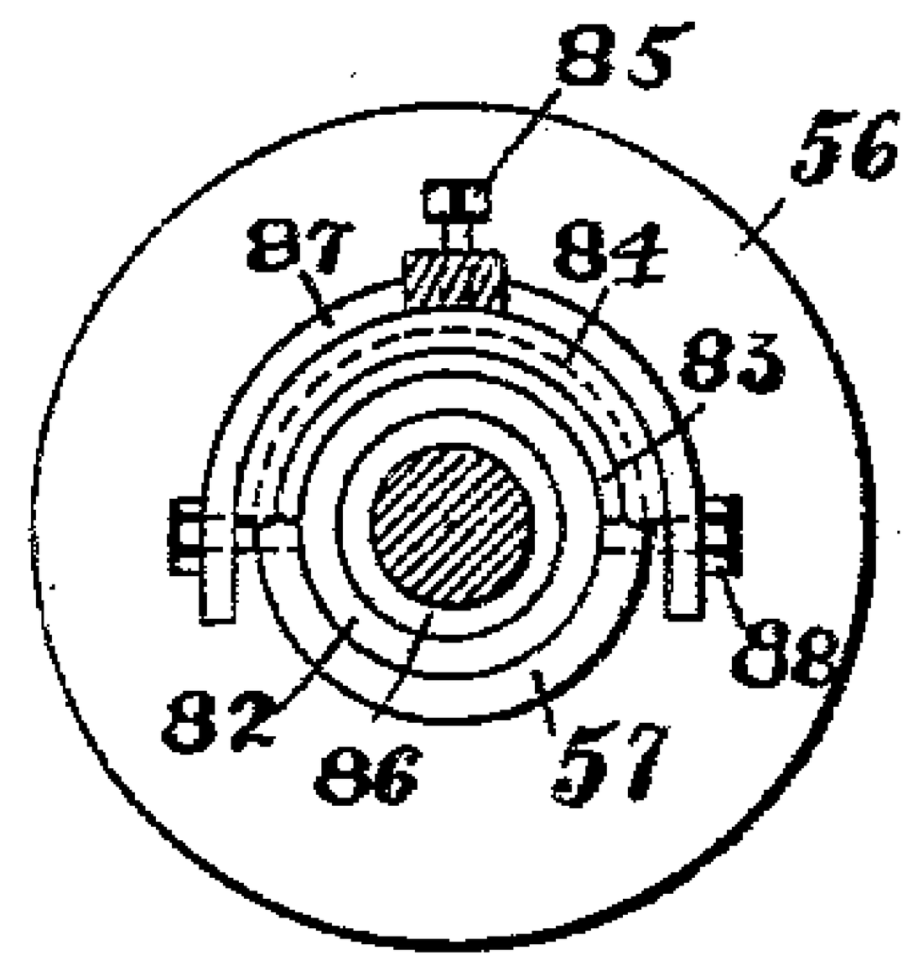


Fig. 18

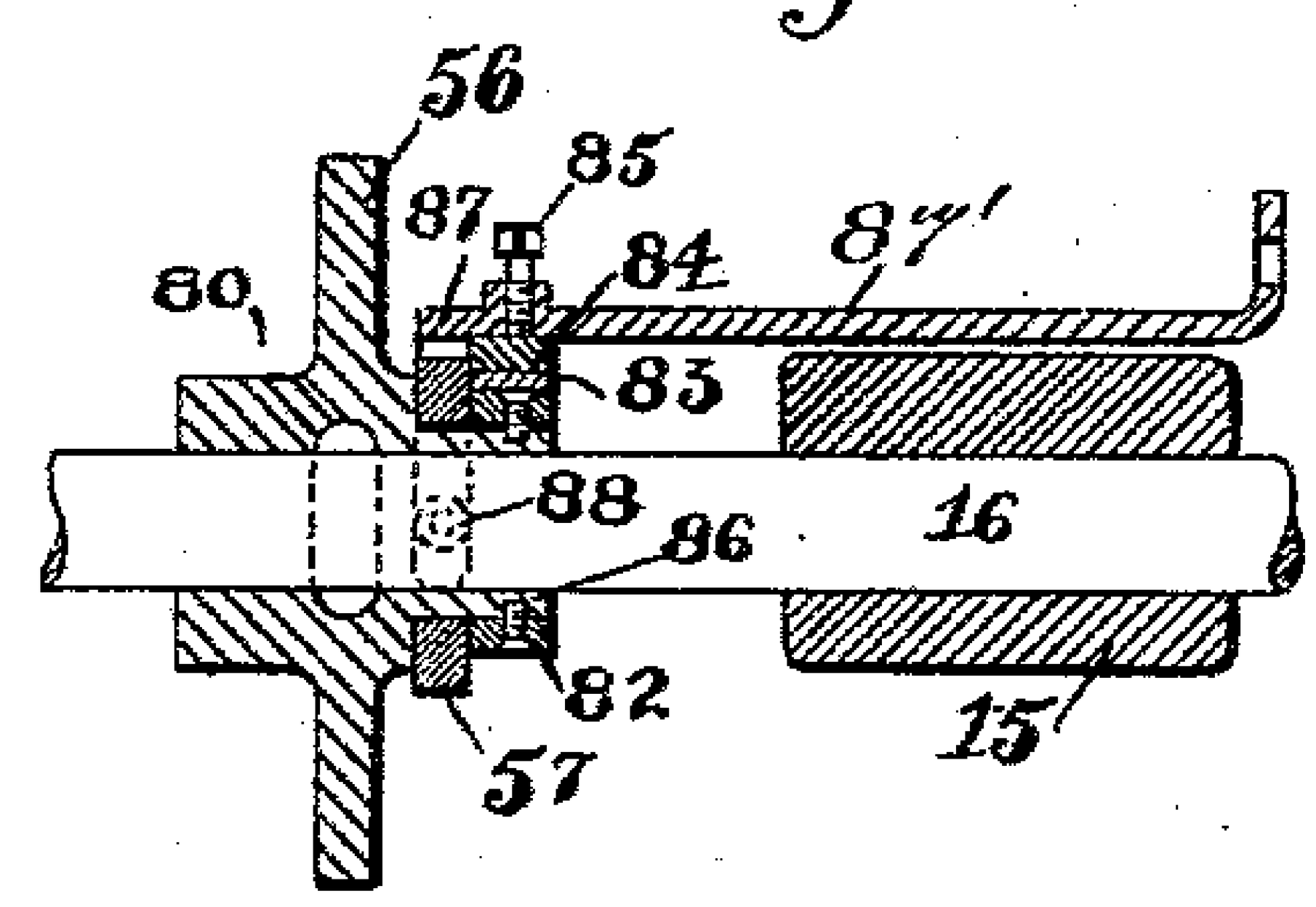


Fig. 15

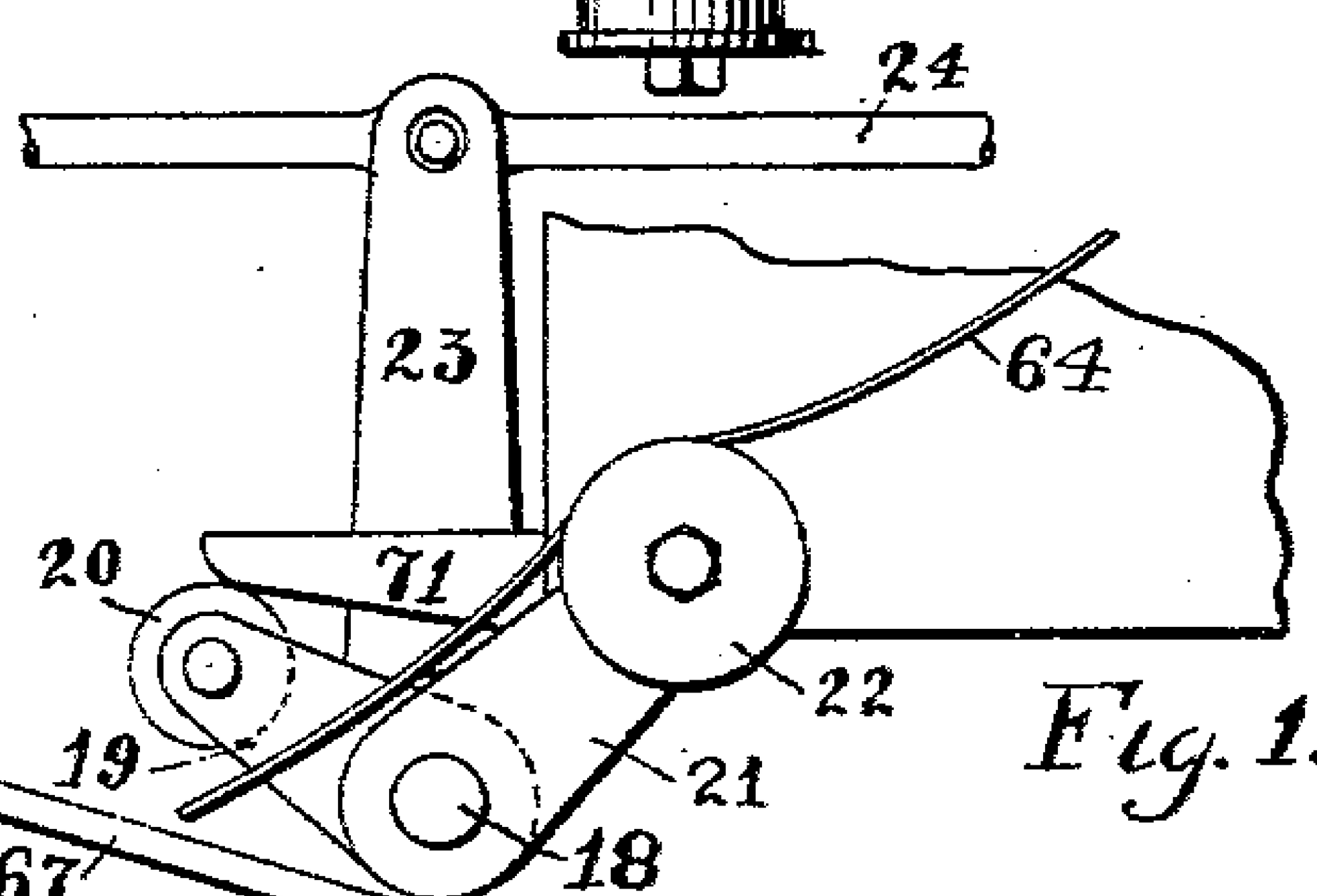
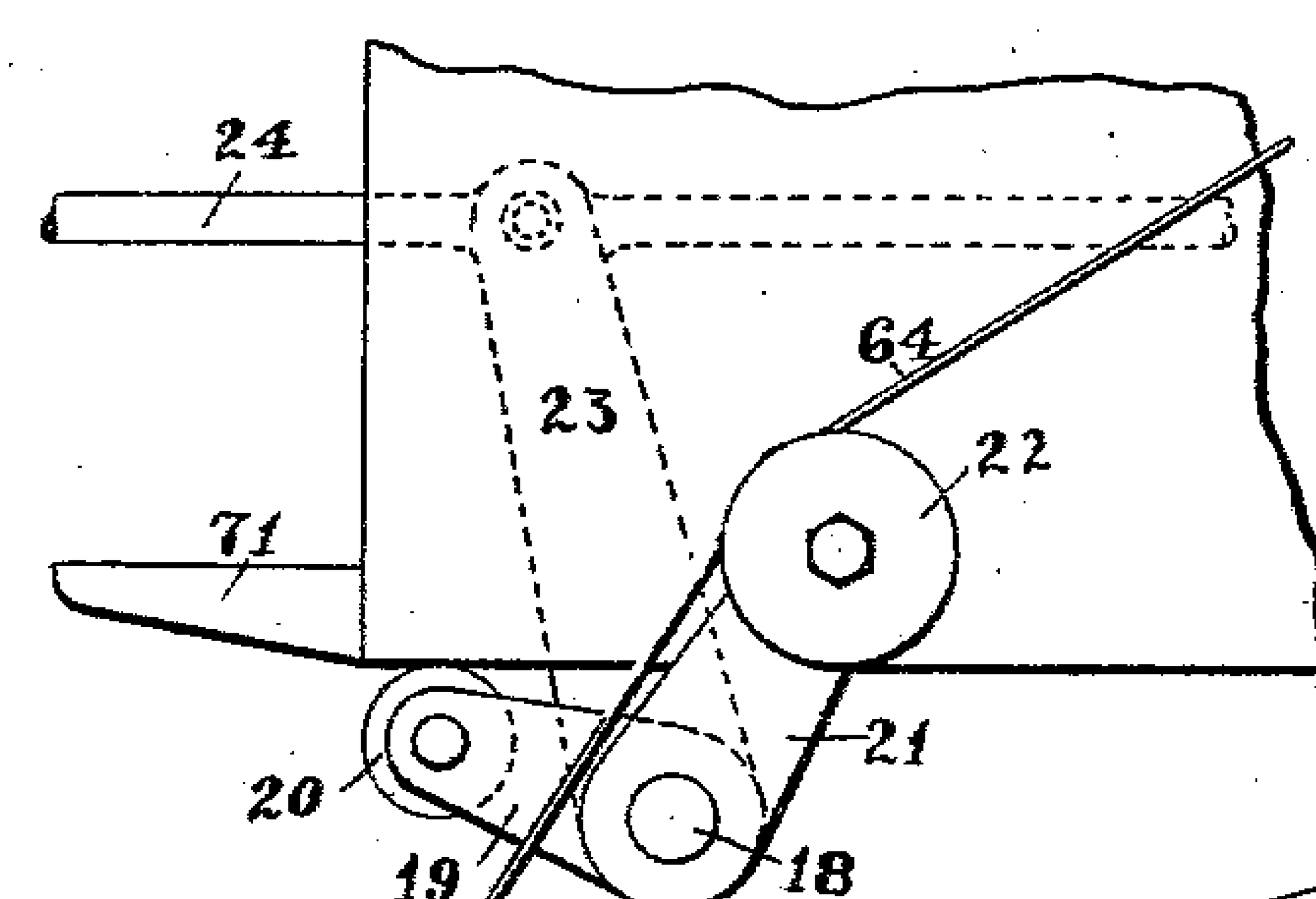


Fig. 14



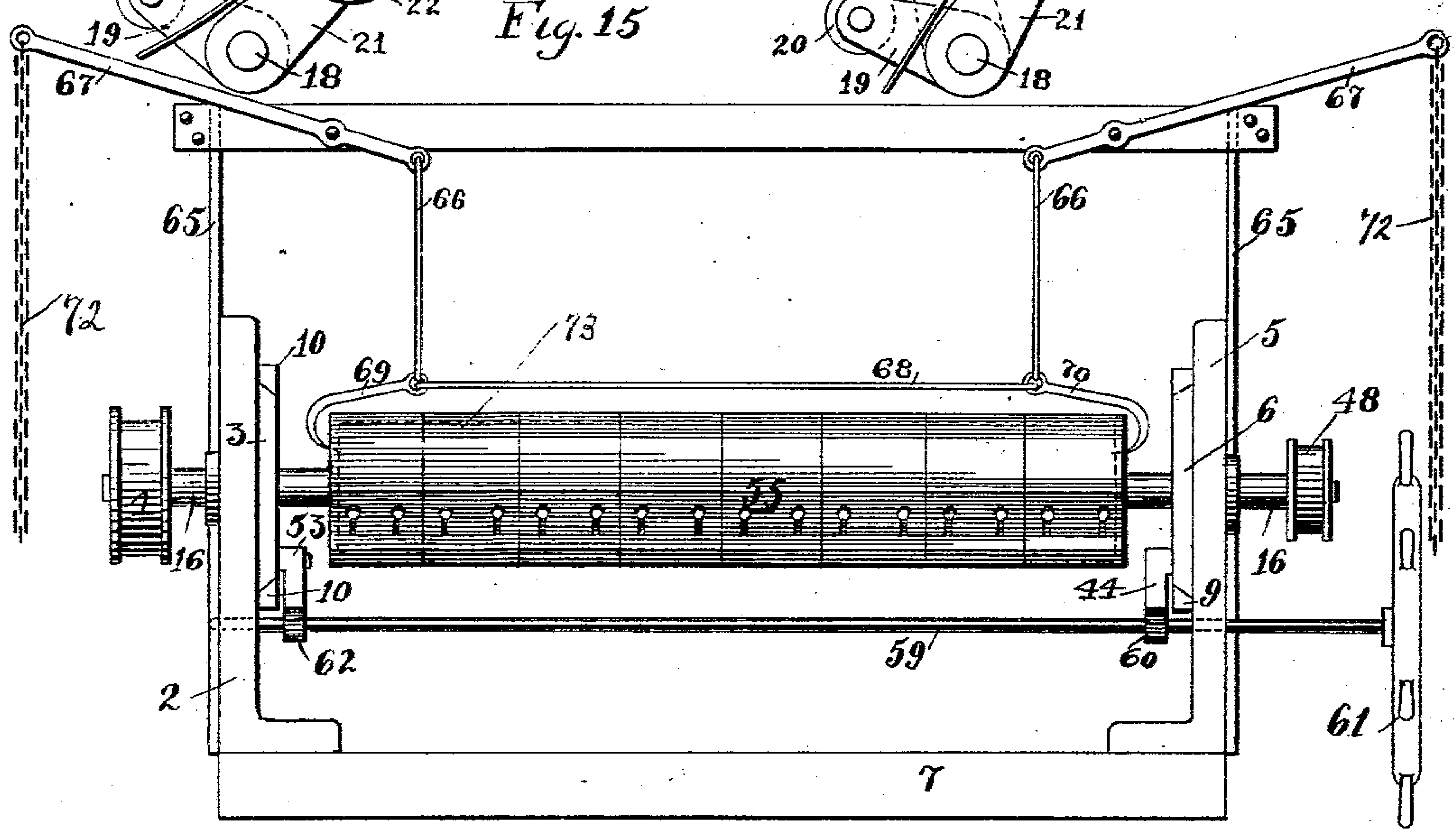


Fig. 17

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UNITED STATES PATENT OFFICE.

CONSTANTINE ALEXANDER HEGE, OF SALEM, NORTH CAROLINA.

MACHINE FOR CUTTING CROSS-TIES.

SPECIFICATION forming part of Letters Patent No. 715,477, dated December 9, 1902.

Application filed March 15, 1902. Serial No. 98,426. (No model.)

To all whom it may concern:

Be it known that I, CONSTANTINE ALEXANDER HEGE, a citizen of the United States, residing in Salem, in the county of Forsythe, State of North Carolina, have invented certain new and useful Improvements in Machines for Cutting Cross-Ties, of which the following is a specification.

This invention relates to a machine for cutting cross-ties for railroads wherein the log to be cut is mounted and rotated in a frame or support which is movable to bring the log into engagement with a gang of rotary cutters, the cross-section to which the log is cut being determined by a "form" or pattern cooperating with an abutment in the general manner indicated in Letters Patent of the United States No. 681,218, granted to me August 27, 1901.

The invention comprises an improved organization, hereinafter described in detail, wherein a sliding log carrier or frame is employed and other improved features of construction.

The accompanying drawings show the invention embodied in the form that experience has demonstrated to be a practical and efficient one, although the various features of the invention, broadly considered, may be embodied in other forms, and some of them may be used without the others in machines otherwise differing in construction from that shown.

Figure 1 is a plan view; Fig. 2, a side elevation of the right-hand end of the machine or that at which the log-supporting tail-stock is mounted; Fig. 3, a side elevation of the opposite side of the machine or that at which the head-stock is mounted; Fig. 4, an elevation of the same side of the machine with the slide carrying the head-stock detached; Fig. 5, a rear end elevation of the same side of the frame, and Fig. 6 a plan view thereof; Fig. 7, an elevation of the end of the sliding frame carrying the head-stock and its actuating devices; Fig. 8, a rear elevation of the same; Fig. 9, a plan thereof partly in section; Fig. 10, an elevation of the side of the frame at which the tail-stock is mounted, with the side or member of the sliding frame that carries the tail-stock detached; Fig. 11, an end elevation thereof; Fig. 12, a side elevation of the slide which carries the tail-stock, showing a lever and valve-case of a steam-cylinder for actuating the tail-stock. Fig. 13 is a vertical section on the line *a a* of Fig. 12, showing details of the steam-actuated tail-stock; Fig. 14, a detail elevation showing belt-tightening devices in a position in which the belt is tightened; Fig. 15, a similar view showing the belt loose; Fig. 16, a detail plan view of the belt-tightening devices; Fig. 17, a rear elevation of the machine with some parts omitted. Figs. 18 and 19 are respectively a detail longitudinal and transverse section showing an arrangement by which friction is applied to the abutment against which the "former" works, whereby the abutment-ring is prevented from rotating with the cutter-head shaft, but will rotate in contact with the former.

With respect to the main frame that side or end at which the head-stock is located will be called the "head-frame." The opposite side or end will be called the "tail-frame." Similarly the two ends or members of the sliding frame will be called the "head-slide" and the "tail-slide."

The main frame comprises a head-frame 5 and tail-frame 2, having flanged extensions at the bottom bolted to timbers 7 8. This is a convenient construction with respect to transportation and assemblage of these elemental parts of the frame; but of course any appropriate construction may be adopted, and the two vertical members of the frame may be cross-braced by appropriately-located tie-rods, if desired. The head-frame 5 is provided with gibs 9 9 for receiving the head-slide 6, and the tail-frame 2 is provided with gibs 10 10 for receiving the tail-slide 3. The head and tail frames 5 and 2, with the timbers 7 and 8, form the main frame of the machine that carries the revolving cutters and the feed mechanism for advancing and rotating the log. The head-slide 6 and tail-slide 3 carry, respectively, the head-stock 11 and tail-stock 12, together with the gear for rotating the head-stock and the steam-cylinder and piston for driving the tail-stock into the log when it has been properly adjusted or centered, as hereinafter described. The head-frame 5, Fig. 4, is substantially a vertical plate formed with a horizontal elongated open-

ing 14, within which the shaft of the head-stock 11 and parts pertaining thereto move in a horizontal direction. The gibs 9 9 are placed in the construction shown upon the inner face of the head-frame above and below the opening 14 and receive the head-slide 6, shown detached in Fig. 7.

Extending through the head-frame 5, substantially in line with the center line of the slot or opening 14, is a bearing hub or bushing 15 for the cutter-shaft 16, on which the cutter-heads 55 are mounted. A similar hub 17, located below the lower gib 9 and in rear of the cutter-shaft, has mounted in it a rock-shaft 18, Figs. 4 and 6. A radial arm 19, mounted within the head-frame 5 on the rock-shaft 18, is provided at its end with a roller 20. On the other end of the rock-shaft on the outside of head-frame 5 is secured another radial arm 21, provided at the end with an idler pulley or roll 22. On the inner end of the rock-shaft 18 is secured a radial arm 23, the end of which is pivotally connected with an endwise-movable rod 24, Figs. 3 and 15, and at the opposite ends of this rod are attached vertically-disposed hand-levers 25 26, pivoted at their lower ends upon the flange or horizontal part of the frame 5.

On the outer face of the head-frame 5 and near the rear edge thereof is bracket 27, carrying a bearing 28, to which is attached a yoke 29. The hollow hub of the bevel-gear 30 has its bearing in the yoke 29, and the gear is held in place between the end of the bearing 28 and the yoke, the axes of the bearing 28 and gear being coincident. An endwise-movable feed-shaft 31 passes through the bearing 28 and through the gear 30, to which latter it is splined. The bracket 27 carries the stud 32, the axis of which is perpendicular to that of the bearing 28, and on this stud rotates a pulley 33, actuated by the belt 64, which also passes over a pulley 58, fast on the cutter-shaft 16, to which is applied the main driving-pulley 4. The pulley 33 is formed with or has attached to it a beveled gear 34, meshing with the beveled gear 30.

The head-slide 6, Figs. 3 and 7, consists of a vertically-disposed plate provided with an elongated opening 35, which embraces the cutter-shaft. The edges of the plate 6 are beveled to fit and slide in the gibs 9 9, and to its inner face is fastened a hub 36, having arms 37 37, extending diametrically therefrom on opposite sides. The head-stock shaft 11′, carrying the ordinary head-stock 11, rotates in a bearing in the hub. On the shaft 11′, adjacent to the head-stock, are located a plurality of pattern-pieces or formers 38, and between them and the end of the hub are washers 39, which receive the end thrust of the head-stock, as hereinafter described, and reduce wear by friction. Outside the head-slide 6 a worm-gear 13 is keyed to the shaft 11′. This gear is shown as incased by a cover 40, which is provided at the bottom with hubs 41 41, between which is located a worm 42. The feed-shaft 31 passes through these hubs, is splined to the worm, and is held in position by collars 43, screwed upon or pinned to the feed-rod. Near the lower edge of the inner face of the slide 6 is a rack 44, engaging a pinion 60 on a shaft 59, having a hand-wheel 61 applied thereto.

The tail-frame 2, Figs. 2, 10, and 11, is similar to the head-frame 5, being provided with gibs 10 10 to receive the tail-slide 3, Figs. 12, 13. It is provided with a hub 45, which is alined with the hub 15 to receive the cutter-shaft 16. The tail-slide 3 is similar to the head-slide 6, being provided with a rack 53, engaged by a pinion 62, secured upon the shaft 59, hereinbefore mentioned. It also has attached to it a steam-cylinder 50, having attached to it radial arms 47 47, extending in opposite directions parallel with the similar arms 37 37 at the opposite side of the machine. A piston 48′ works in the cylinder and is attached to a piston-rod 48, upon the inner end of which is fastened the tail-stock 12. The tail-stock, piston-rod, and piston all rotate together in the construction shown. As shown particularly in Fig. 13, the cylinder is provided with a valve-case and ports. Steam is admitted to and exhausted from the cylinder by means of a four-way valve 51, 51′ being the steam-pipe from the boiler and 51^2 the exhaust-passage. The valve 51 is actuated by a lever 52. It will be observed that the ports or passages connect with the cylinder a short distance from the ends, so as to form steam-cushions. To provide for the initial actuation of the piston, a small channel 50^3 is cut in the inner face of the cylinder from these ports or passages to the ends of the cylinder. To insure accurate alinement of the axes of the head and tail stocks, the rack 53 on the head-slide 3 is made adjustable by means of slots and bolts and stop-screws 54, as seen particularly in Fig. 12. The cutter-shaft is equipped with cutters of suitable character—as, for instance, such as those shown in my prior patent above mentioned—and receives its motion from a pulley 4, located on the end thereof outside the tail-frame 2.

The cutter-shaft 16 carries an abutment-ring 56, mounted on a loose collar 57, enveloping the shaft and adjustable thereon, as indicated and as shown in my prior patent. This abutment may be set to coöperate with either of the formers 38. This feature of the present machine is substantially the same as that of my prior patent and provides a means whereby logs of varying size when mounted between the head and tail stocks may be cut each to that standard size to which it is adapted. The arms 47 47 of the tail-slide and those 37 37 of the head-slide are braced by tie-rods 63 63 to resist the strain with which the log is clamped between the head and tail stocks and prevent binding of the slides against the head-frames 2 and 5.

At the sides of the front of the machine are

mounted posts 65, the upper ends of which are connected by a cross-beam approximately in line above the axes of the head and tail stocks. Near each end of the cross-piece is pivoted a lever 67, and from the inner ends of these levers, suspended by links 66, connected by a cross-link 68, are two hooks or grapples 69 and 70. To the outer ends of the levers are attached chains 72 or other appropriate means of operating the levers. The logs placed upon skids or a suitable platform are advanced toward the machine, and one, 73, (dotted lines, Fig. 17,) may be engaged by the grapples 69 70, as indicated, raised and swung inwardly by means of the chains attached to the outer ends of the levers, so as to hang suspended substantially in line with the axes of the head and tail stocks. The chains 72 may be sufficiently long to lie upon the ground, and each operator may hold the log suspended in proper position by placing his foot upon the chain. Of course any appropriate means for supporting the log in line between the head and tail stocks may be adopted. By preference, however, the log should be so supported—as, for instance, by the hooks 69 70—that the operator at either end of the machine may swing it or turn it somewhat about its axis to adapt it in position to the former, which determines the cross-section to which it is to be cut. Aside from the employment of mechanism for hoisting and supporting the log between the head and tail stocks some such mode of holding it to an extent freely, so that it may be partly rocked or rotated, forms a subsidiary feature of the invention, and for many reasons I prefer to suspend the log rather than to support it in other ways. Log supporting or suspending mechanism coöperates efficiently with a power-actuated tail-stock to the end that the log may be quickly lifted into position, alined or properly adjusted with reference to the former, and secured automatically by the tail-stock.

I have shown a machine with a plurality of formers, and the use of multiple formers is substantially a requisite to the economical practical operation of these machines in the field, as it is possible for a single machine to cut logs of various sizes to the several standard cross-sections. The machine herein described may contain but a single former, if so desired.

Experience has demonstrated that if in a machine of this class the abutment-ring 56 revolves positively with the cutter-head shaft there is considerable wear on the formers. This defect may be obviated by frictionally holding the abutment so that it will not revolve with the shaft, but will turn with the former by reason of the pressure of contact between them. One way by which this may be conveniently accomplished is shown in Figs. 18 and 19. To the reduced end 86 of the hub 80 of the abutment-ring 56 on the side adjacent bearing 15 is applied a loose collar 57, into which pass bolts 88 88 in the arms 87 87 of the forked end of the abutment-adjusting arm 87', which, as here shown, extends to the outside of the side frame 5 and is to be appropriately held in any adjusted position. The collar 57 is held in place by a ring 82, bolted to the hub, as shown. On this ring 82 bears a friction-saddle comprising a leather facing 83 and metal backing 84 and which embraces approximately one-half of the circumference of the ring 82. It may be held in position between this ring and the abutment-adjusting arm in any appropriate way. A set-screw 85, carried in the abutment-adjusting arm, bears upon the saddle, and by its manipulation any required degree of friction may be applied to oppose a tendency of the abutment to rotate with the shaft 16. When the former, which is driven at a speed of rotation very much less than that of the cutter-head shaft, comes in contact with the abutment, which will then be stationary, the latter is set into rotation, and revolving approximately with and at the same rate of speed as the former. It will be apparent that wear of the opposing surfaces will be very much reduced over that which would occur if the former came in contact with the abutment while the latter was revolving at the same speed as the cutter-head shaft.

The log to be cut having been advanced upon any appropriate platform or support, so that it may be grappled by the hooks 69 70, is hoisted to the proper elevation and swung inwardly between the head and tail stocks. The operator at the head-stock side of the machine being in position to aline the log with the formers 38, of which there may be one or more, may adjust the log with the assistance of the operator at the tail-stock with reference to the former to determine the cross-section to which it is to be cut by rocking or partially turning the log in the grasp of the hooks 69 70, or the rock-shaft 18 may be actuated by means of either hand-lever 25 26, so as to cause the idler 22 to tighten the belt 64, and thereby rotate the head-stock shaft to bring the desired former into proper relation to the log which is hanging in alinement with the axes of the head and tail stocks. This is an important feature, for the reason that the logs brought to the machine vary in cross-section. Some are circular, some semicircular or halves, others are quarters, and there may be still other irregular shapes. When the operator is satisfied with the relation of the log to the former, he moves the lever 52, and the tail-stock is by action of steam or other fluid under pressure in the cylinder 50 forced quickly into the end of the log, thus securing it firmly between the head and tail stocks. The active side of the piston is until the valve is reversed under constant pressure. The hand-wheel 61 is now rotated, and by means of the pinions and the racks on the head and tail slides the log-carrying frame is moved toward the cutter-head, which

is of course continuously revolving at a comparatively high rate of speed. During this movement a shoe 71, projecting from the rear edge of the head-slide 6, strikes against the roller 20 on the arm 19, and the shaft 18 is rocked and the idler 22 is forced against the belt 64, thus tightening it. The pulley 33 is now driven, and by means of the bevel-gears 34 30 rotation is imparted to the splined feed-shaft 31, and the worm thereon drives the worm-gear 13 and rotates the head-stock 11. The log while advancing toward the cutter-head is then put into rotation at a speed materially less than that of the cutter-head. As the log-carrying frame is advanced the cutters commence to act upon the log, and the cross-section to which it is cut is determined by the coöperative action of the former and the abutment-ring 56. When the log has been cut, the carriage is retracted, the steam connection to the cylinder of the tail-stock is reversed, the tail-stock is withdrawn, and the completed cross-tie discharged from the machine.

This machine is characterized by certain features of construction and operation, which, so far as I am aware, are new. Of importance among these are the following: The sliding frame travels in ways located in vertical planes, and therefore the width of the machine is reduced to a minimum and the whole central portion of the machine between the head and tail slides of the log-frame may be left open to permit free discharge of the completed ties. This part of the construction is also such that there is no sliding part between the head and tail stocks upon which chips may accumulate. Aside from these features of advantage, however, there is the further one that by so arranging the ways in or upon which the log-carrying frame slides the strain due to the end thrust between the head and tail stocks may be neutralized by the brace-rods 63 63. However great, therefore, this strain may be it is prevented from affecting the free travel of the head and tail slides. In the particular arrangement of these brace-rods—that is, between arms extending radially from opposite sides of the axes of the head and tail stocks and in the angular direction shown in the drawings, Figs. 3 and 7—there is no obstruction or crowding, such as would interfere with the ready handling of the logs and placing of them between the head and tail stocks. The feature of cross-bracing the head and tail stock sides of the sliding log-carrying frame is not dependent upon the particular construction and arrangement of the ways in or on which the frame slides. Of course the tail-stock may be operated by hand in any appropriate way, as in my prior patent mentioned, or otherwise; but experience has demonstrated that a power-actuated tail-stock, and particularly one actuated by a piston acted upon by steam or other fluid pressure, has many advantages in a machine of this character and constitutes a very marked improvement therein. The logs being heavy and not of uniform cross-section, it is more or less difficult to adjust them relatively to the former. By providing a quick-acting automatic power-actuated tail-stock the tail-stock may be shot against the end of the log by a mere touch upon the lever that controls the power that actuates it. The importance of this will be more appreciated when it is suggested that the proper positioning of the log requires skill and close attention on the part of the operator, and the log, being movably supported or suspended between the head and tail stocks, might very easily move or swing out of position if the operator were required to manually operate the tail-stock. A power-actuated tail-stock and provision for rotating the former at will independently of the movement of the log toward the cutters for the purpose of bringing it into proper relation to a given log, either separately considered or in conjunction with any suitable mechanism by which the log may be alined between the head and tail stocks, are of great importance in the practical operation of a machine of this character, since they all tend to perfect work and increased output. Provisions for adjustment of either the head or tail slide or one side or end of the sliding frame, such as is afforded by the adjustable rack on the tail-slide 3 or otherwise, is of importance, since in setting up the machine the axes of the head and tail stocks may be adjusted to be absolutely coincident, and similar adjustments may be made during the life of the machine as conditions due to wear or other causes may require it. The general construction of the machine, consisting, as it does, of end sections between which the only connections are removable tie-rods or braces aside from the base timbers or supports 7 8, on which the head and tail frames are removably mounted, affords convenience and economy in shipping and facility in assembling; and finally I desire to emphasize the importance in this machine of employing a mechanism for bringing the logs into position between the head and tail stocks and there supporting them in such a way that they may be adjusted relatively to the head and tail stocks. The special construction of the steam-cylinder by which the piston is cushioned at each end of its stroke, in combination with the head and tail stocks of the cross-tie-cutting machine, is of great importance, as the machine is relieved from shocks, jars, and unnecessary strains due to the automatic actuation of the tail-stock. These are deemed to be the leading features of this machine; but by the foregoing recital thereof it is not intended to exclude minor features of construction hereinafter claimed.

I claim as my invention—

1. In a cross-tie-cutting machine, a main frame comprising vertically-disposed head and tail frames, in combination with a cutter-head shaft mounted in bearings therein, and

a sliding log-carrying frame comprising head and tail slides fitted to move in or on ways in the head and tail frames and carrying head and tail stocks and means for rotating the head-stock.

2. In a cross-tie-cutting machine, a main frame comprising vertically-disposed head and tail frames, in combination with a cutter-head shaft mounted in bearings therein, and a sliding log-carrying frame comprising head and tail slides fitted to move in or on ways in the head and tail frames and carrying head and tail stocks, means for rotating the head-stock, and means extending between the two sides (head and tail slides) of the log-carrying frame for bracing them against outward strains.

3. In a cross-tie-cutting machine, a main frame comprising vertically-disposed head and tail frames, in combination with a cutter-head shaft mounted in bearings therein, and a sliding log-carrying frame comprising head and tail slides fitted to move in or on ways in the head and tail frames and carrying head and tail stocks, means for rotating the head-stock, and tie-rods or braces symmetrically disposed with reference to the axes of the head and tail stocks extending between the two sides of the sliding frame and serving to resist the endwise strain due to the engagement of the tail-stock with the log.

4. In a cross-tie-cutting machine, a main frame comprising vertically-disposed head and tail frames, in combination with a cutter-head shaft mounted in bearings therein, and a sliding log-carrying frame comprising head and tail slides fitted to move in or on ways in the head and tail frames and carrying head and tail stocks, means for rotating the head-stock, and bearings in the head and tail slides for the shafts or parts carrying the head-stock and the tail-stock, arms projecting from opposite sides of each of said bearings and transverse tie-rods or braces connecting the opposite arms.

5. In a cross-tie-cutting machine, a main frame comprising vertically-disposed head and tail frames, in combination with a cutter-head shaft mounted in bearings therein, and a sliding log-carrying frame comprising head and tail slides fitted to move in or on ways in the head and tail frames and carrying head and tail stocks, means for rotating the head-stock, bearings in the head and tail slides for the shafts or parts carrying the head-stock and the tail-stock, arms projecting from said bearings upwardly and rearwardly and downwardly and outwardly and transverse tie-rods or braces connecting the arms.

6. In a cross-tie-cutting machine, the combination of a main frame carrying a gang of rotating cutters, a log-carrying frame sliding in ways thereon, a head-stock carried by one side of the sliding frame, a tail-stock carried by the opposite side, and tie-rods or braces extending between said two sides and arranged respectively in planes above and below the ways in which the sides slide.

7. In a cross-tie-cutting machine, the combination of a main frame carrying a gang of rotating cutters, a log-carrying frame sliding in ways thereon, a head-stock carried by one side of the sliding frame, a tail-stock carried by the opposite side and two tie-rods or braces extending between the two sides of the sliding frame and arranged respectively in coincident diametrical lines and in planes above and below the ways in which the log-frame slides.

8. In a cross-tie-cutting machine, the combination of a stationary frame comprising vertical horizontally-slotted end members, a cutter-shaft mounted in bearings in said members in rear of the horizontal slot, a log-carrying frame sliding in or on said members, a power-driven head-stock shaft extending through the slot in one of said members and a tail-stock and its support extending through the slot in the other of said members.

9. In a cross-tie-cutting machine, the combination of a stationary frame comprising vertical horizontally-slotted end members, a cutter-shaft mounted in bearings in said members in rear of the horizontal slot, a log-carrying frame sliding in or on said members, a power-driven head-stock shaft extending through the slot in one of said members, a tail-stock and its power-actuated shaft or piston extending through the slot in the other of said members.

10. In a cross-tie-cutting machine, the combination of a main frame, a gang of rotating cutters, a main driving-shaft, a movable log-carrying frame, normally inactive head and tail stocks carried thereby, a rotatable "former" also carried thereby whose axis is coincident with that of the head and tail stocks, mechanism for advancing the carriage toward and retracting it from the cutters, mechanism whereby the head-stock and "former" are rotated when the carriage is advanced to the cutters and means, under the control of the operator, for causing rotation of the "former" by power from the main shaft when the frame is in its retracted position, to thereby adjust the "former" with reference to the cross-section of the log to be cut.

11. In a cross-tie-cutting machine, the combination of a main frame, a gang of rotating cutters, a main driving-shaft, a movable log-carrying frame, normally inactive head and tail stocks carried thereby, a rotatable "former" also carried thereby whose axis is coincident with that of the head and tail stocks, mechanism for advancing the carriage toward and retracting it from the cutters, mechanism whereby the head-stock and "former" are rotated when the carriage is advanced to the cutters, means, under the control of the operator, for causing rotation of the "former" by power from the main shaft when the frame is in its retracted position, to thereby adjust

the "former" with reference to the cross-section of the log to be cut, and quick-acting power devices, under the control of the operator, for actuating the tail-stock.

12. In a cross-tie-cutting machine, the combination of a main frame, a gang of rotating cutters, a main driving-shaft, a movable log-carrying frame, normally inactive head and tail stocks carried thereby, a rotatable "former" also carried thereby whose axis is coincident with that of the head and tail stocks, mechanism for advancing the carriage toward and retracting it from the cutters, mechanism whereby the head-stock and "former" are rotated when the carriage is advanced to the cutters, means, under the control of the operator, for causing rotation of the "former" by power from the main shaft when the frame is in its retracted position, to thereby adjust the "former" with reference to the cross-section of the log to be cut, and fluid-pressure power devices, under the control of the operator, for actuating the tail-stock.

13. In a cross-tie-cutting machine, the combination of a stationary main frame, a gang of rotating cutters mounted therein, a movable log-carrying frame mounted thereon, head and tail stocks carried by the movable frame and power devices carried by the log-frame and controlled by the operator for actuating the tail-stock.

14. In a cross-tie-cutting machine, the combination of a stationary main frame, a gang of cutters rotating therein, a movable log-carrying frame, head and tail stocks carried thereby, a piston-rod on which the tail-stock is mounted, its piston, fluid-pressure cylinder and valve.

15. In a cross-tie-cutting machine, the combination of a main frame, a gang of rotating cutters carried thereby, a movable log-carrying frame, head and tail stocks carried thereby, and a fluid-pressure cylinder also carried by the movable frame for actuating the tail-stock and having its ports so arranged as to cushion its piston when the tail-stock is retracted.

16. In a cross-tie-cutting machine, the combination of a main frame, a gang of cutters carried thereby, a movable log-carrying frame mounted thereon, head and tail stocks and a "former" carried by the movable frame and mechanism for lifting and supporting the log movably between the head and tail stocks whereby it may then be manipulated by the operator to adjust its cross-section with reference to the "former."

17. In a cross-tie-cutting machine, the combination of a main frame, a gang of cutters carried thereby, a movable log-carrying frame mounted thereon, head and tail stocks and a "former" carried by the movable frame, mechanism for lifting and supporting the log movably between the head and tail stocks whereby it may then be manipulated by the operator to adjust its cross-section with reference to the "former," and quick-acting power devices under the control of the operator for actuating the tail-stock.

18. In a cross-tie-cutting machine, the combination of a stationary main frame, a rotatable cutter-shaft mounted therein, a sliding log-carrying frame mounted thereon, a tail-stock carried by one side of the sliding frame, a head-stock and its shaft carried by the other side of the sliding frame, a "former" on the head-stock shaft, mechanism for rotating the head-stock shaft comprising a pulley, as 33, a pulley on the cutter-shaft, a belt connecting the pulleys and belt-tightening devices comprising a rock-shaft and three radial arms one carrying an idler acting on the belt to tighten it, another adapted to be struck by the sliding frame to effect a tightening of the belt as the sliding carriage is advanced to the cutters, and a third adapted to be manually operated at will to tighten the belt regardless of the movement of the sliding carriage.

19. In a cross-tie-cutting machine, the combination of a main frame, a gang of rotary cutters carried thereby, a movable log-frame mounted thereon, head and tail stocks and a rotatable "former" carried by the log-frame, an abutment-ring turning on the cutter-shaft and against which the "former" works, and friction devices applied to the abutment-ring to prevent its rotation by reason of frictional contact with the cutter-shaft but which permit its rotation by reason of frictional contact with the "former."

In testimony whereof I have hereunto subscribed my name.

CONSTANTINE ALEXANDER HEGE.

Witnesses:
W. J. HEGE,
B. E. TESH.