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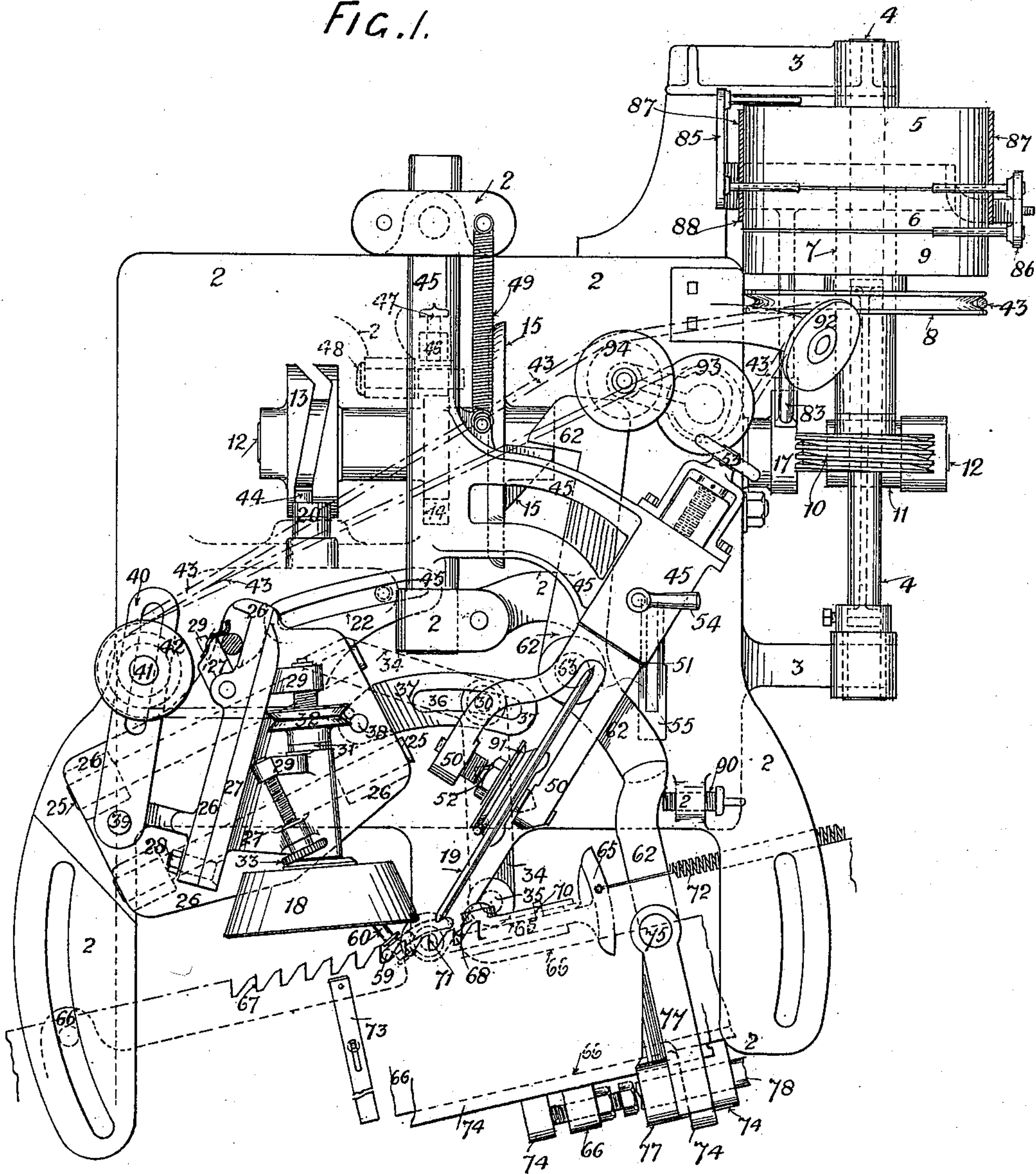
10 Sheets—Sheet 1.

R. TAYLOR, Jr. & L. DUNKERLEY, Jr.
MACHINE FOR SHARPENING SAWS.

No. 599,114.

Patented Feb. 15, 1898.

FIG. 1.



Witnesses:

E. B. Bolton
O. W. Munk

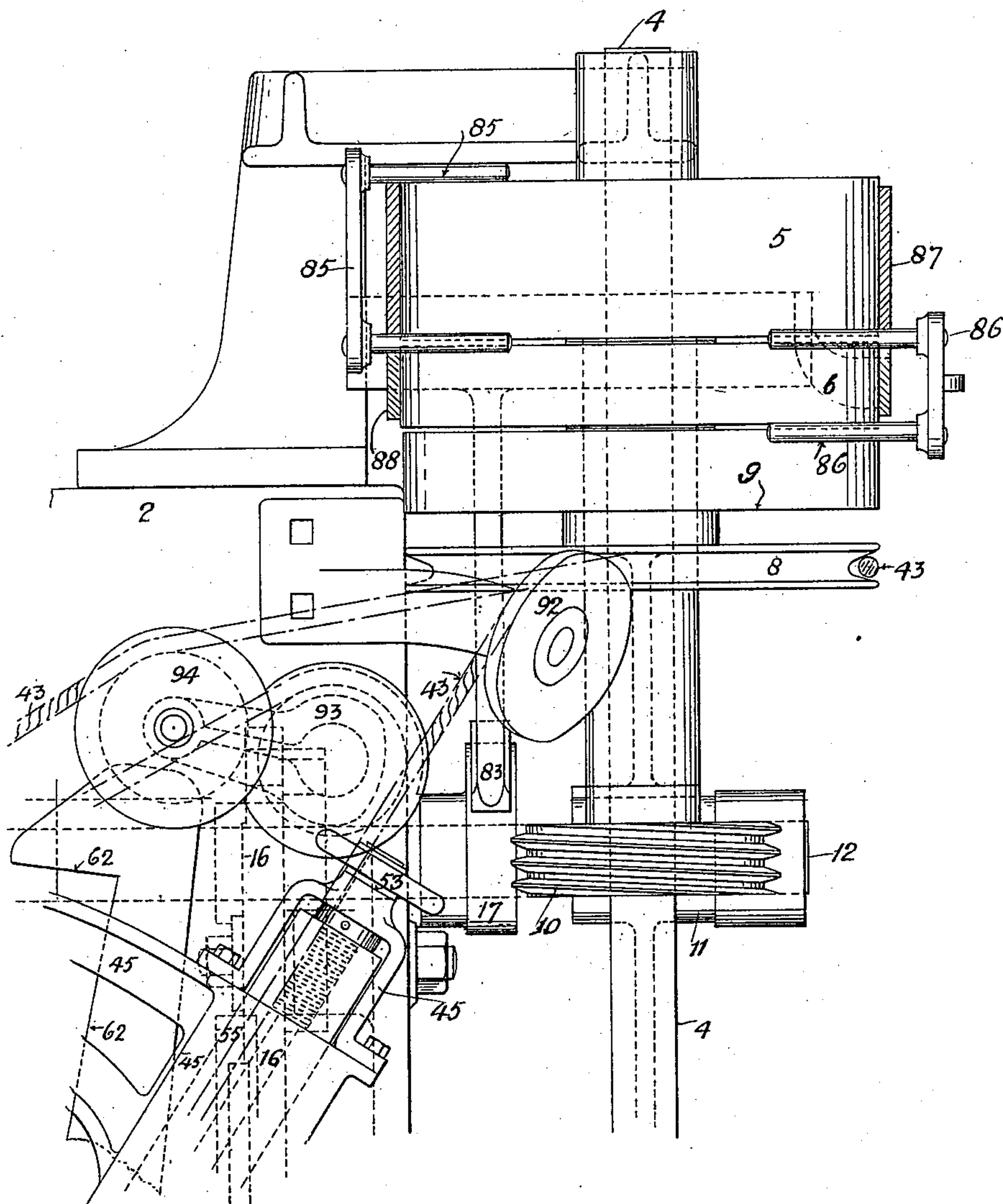
Inventors
Robert Taylor Junior
Luke Dunkerley Junior
By *Richardson*
their Attorneys.

10 Sheets—Sheet 2.

MACHINE FOR SHARPENING SAWS.

Patented Feb. 15, 1898.

Fig. 1.^a



Inventors:

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By

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(No Model.)

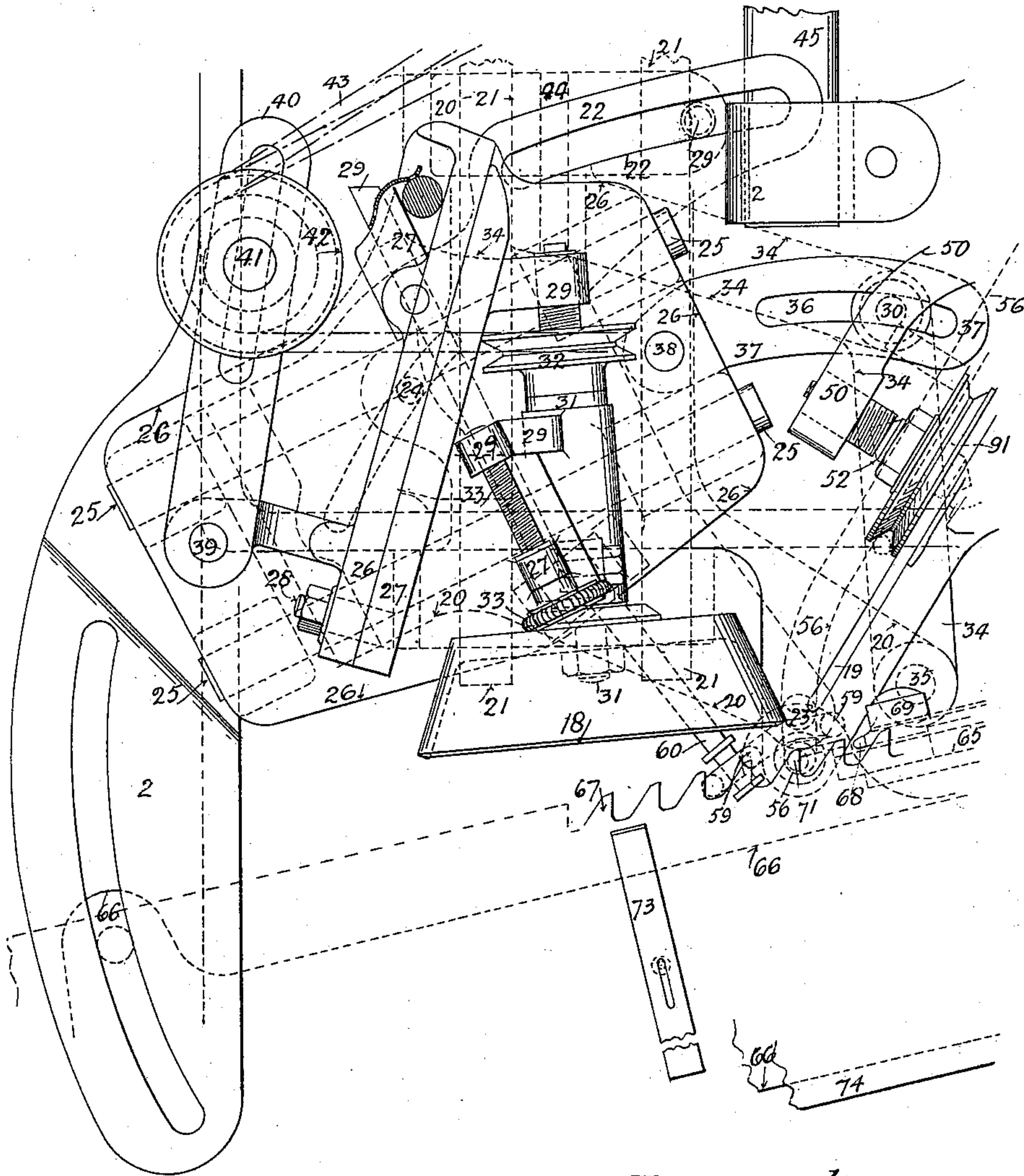
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FIG. 1.^b



Witnesses:

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O. W. Mum

Inventors:
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(No Model.)

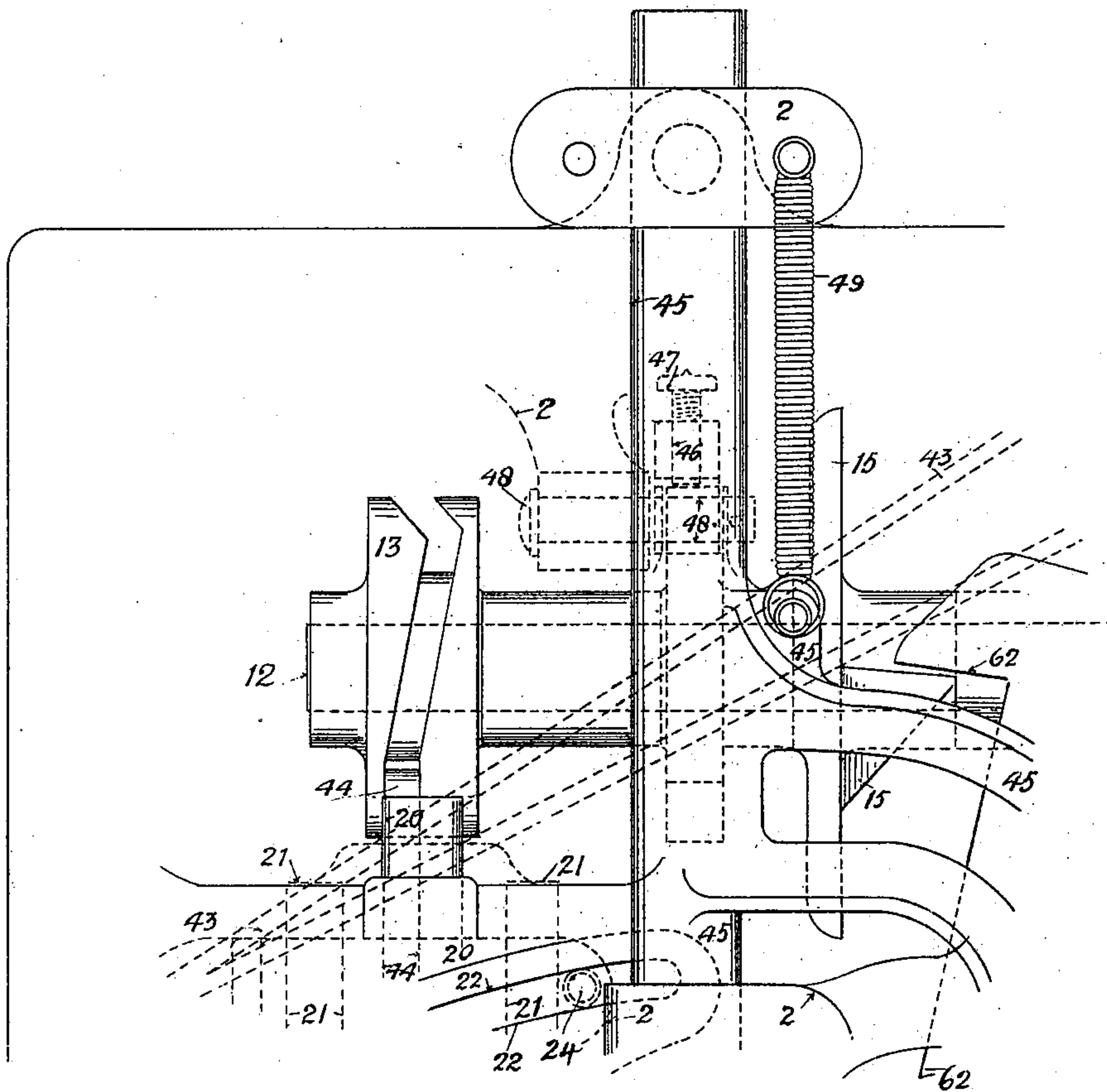
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FIG. 1.^c



Witnesses:

E. R. Bolton

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Inventors:

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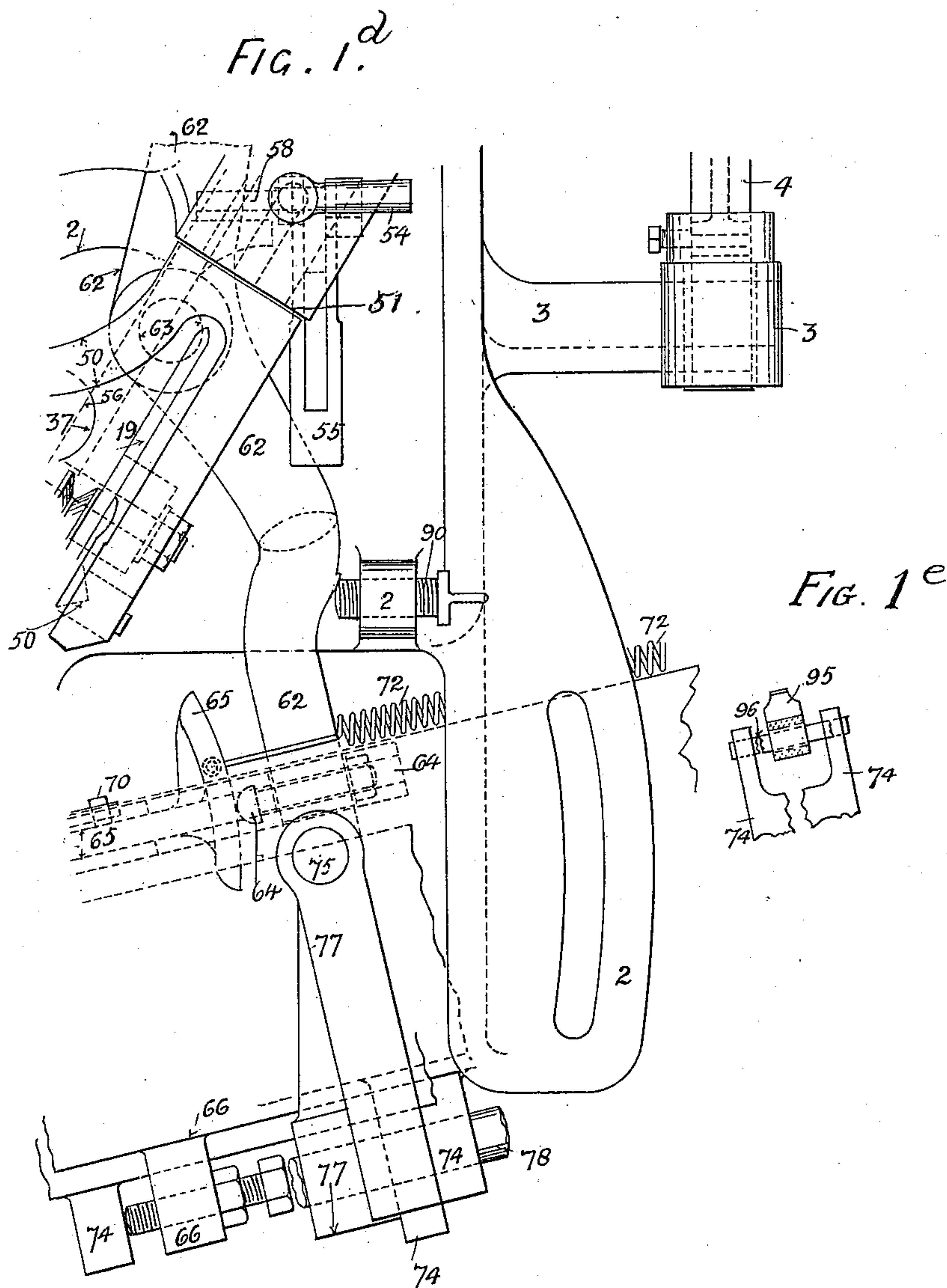
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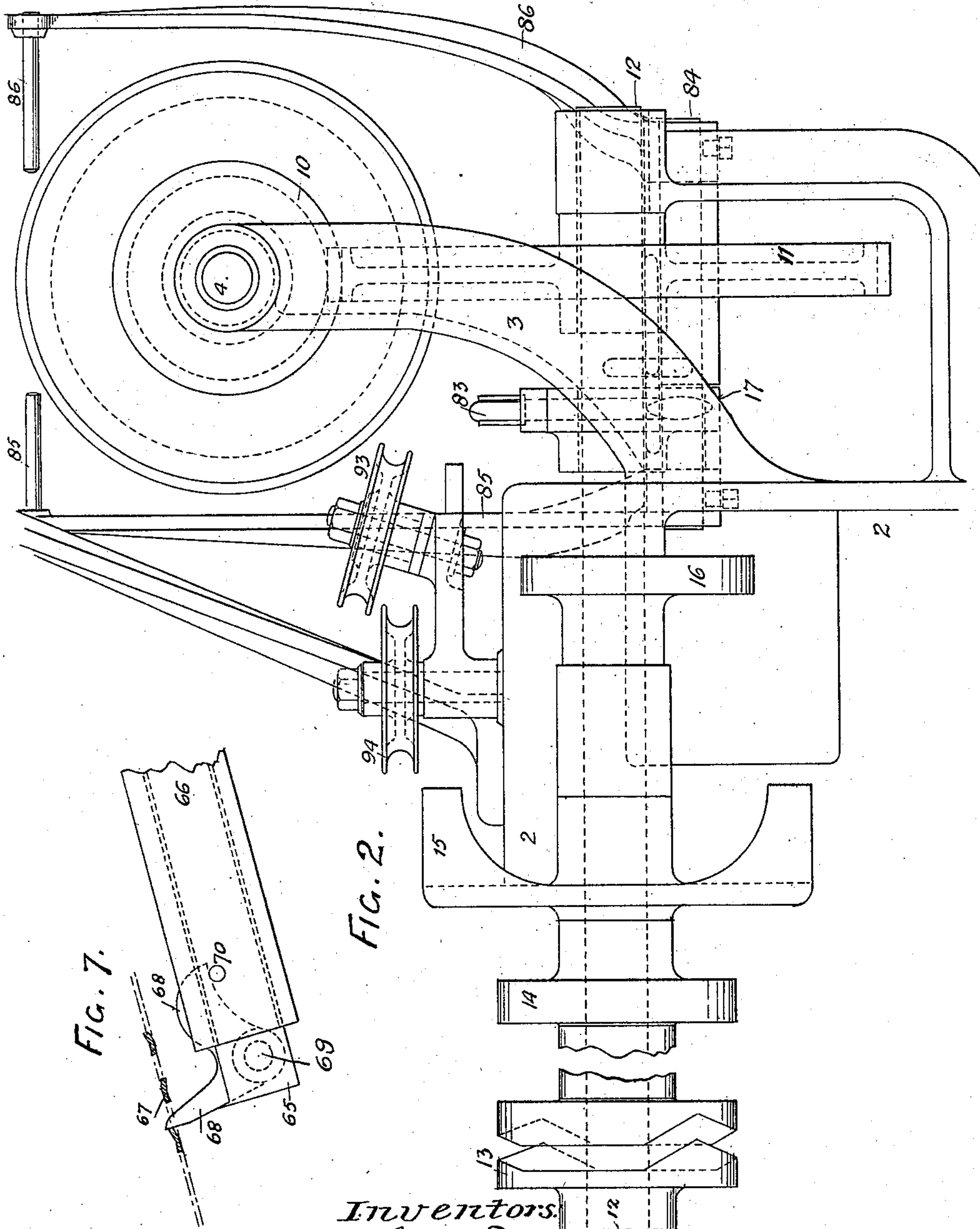
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No. 599,114.

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Witnesses:

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(No Model.)

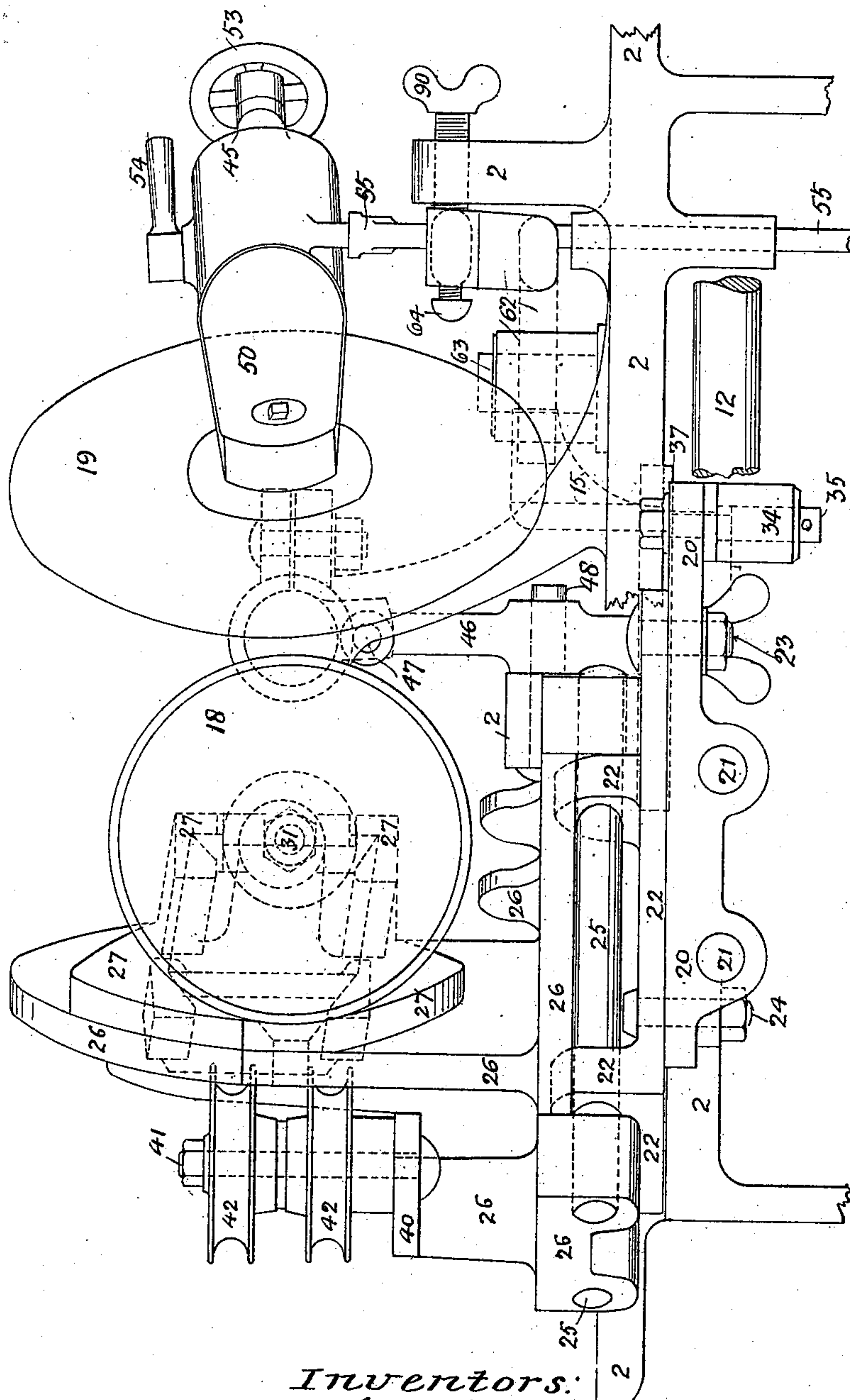
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R. TAYLOR, Jr. & L. DUNKERLEY, Jr.
MACHINE FOR SHARPENING SAWS.

No. 599,114.

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FIG. 3.



Witnesses:

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Luke Dunkerley Junior

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Richard R. [Signature]

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(No Model.)

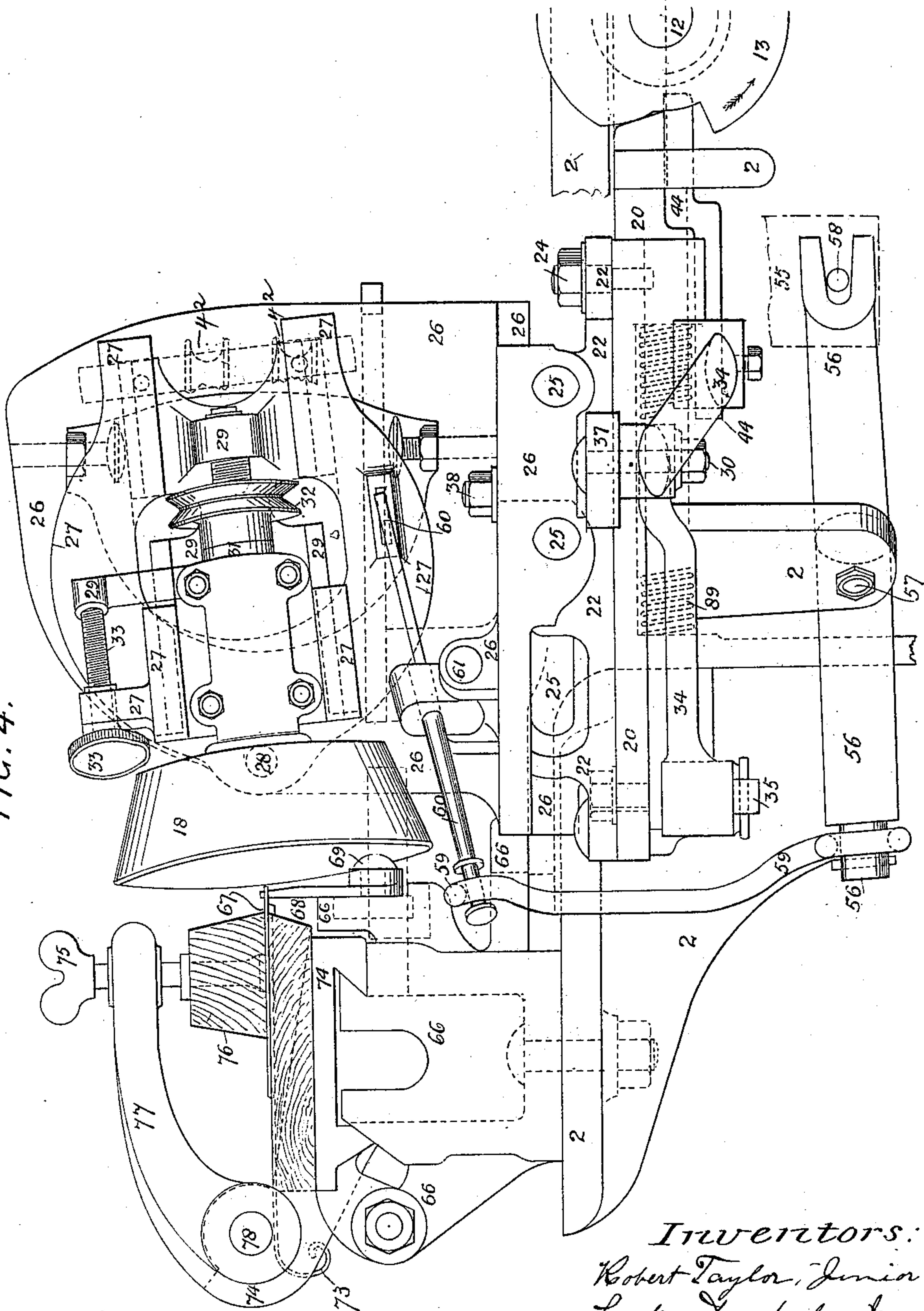
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R. TAYLOR, Jr. & L. DUNKERLEY, Jr.
MACHINE FOR SHARPENING SAWS.

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FIG. 4.



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10 Sheets—Sheet 9.

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MACHINE FOR SHARPENING SAWS.

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FIG. 5.

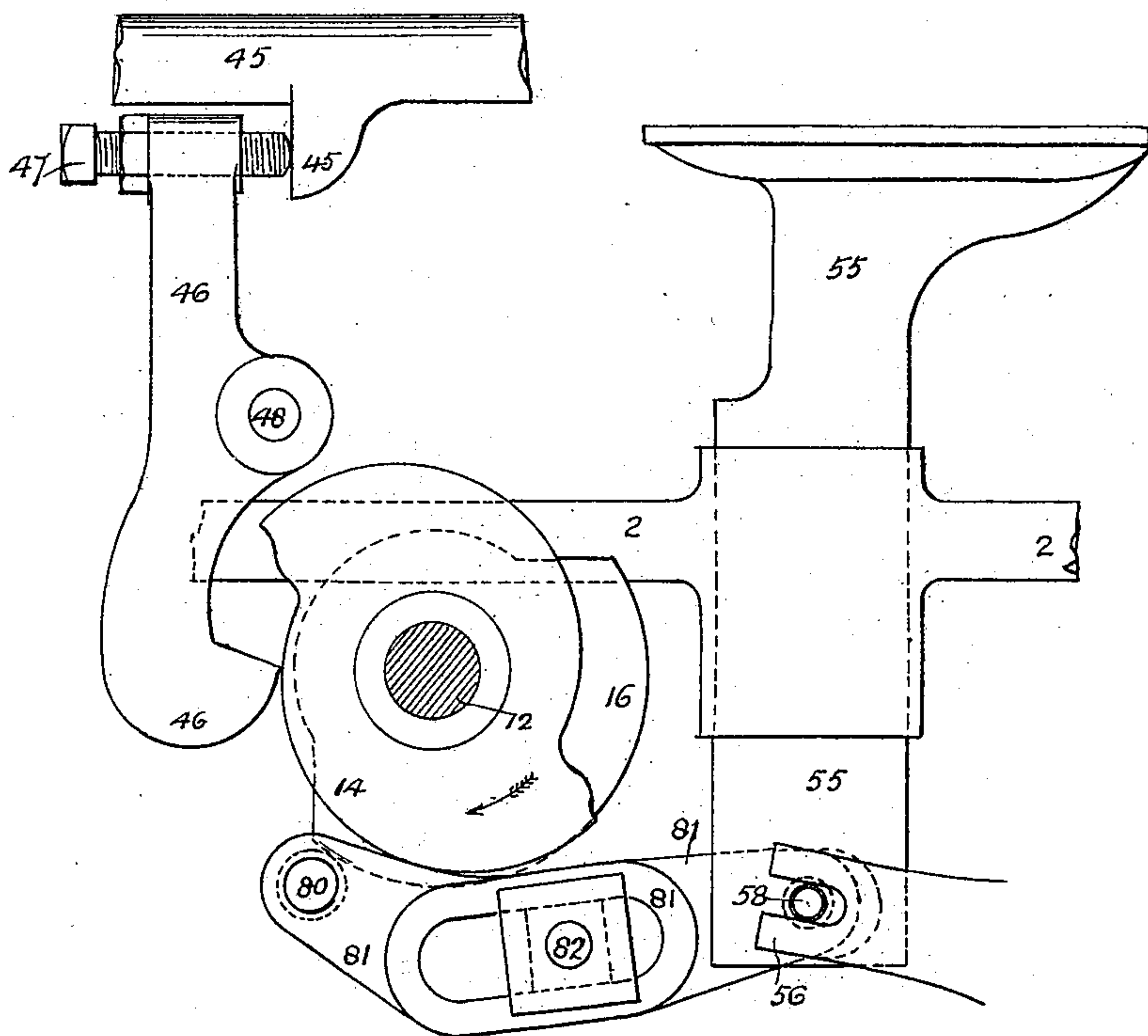
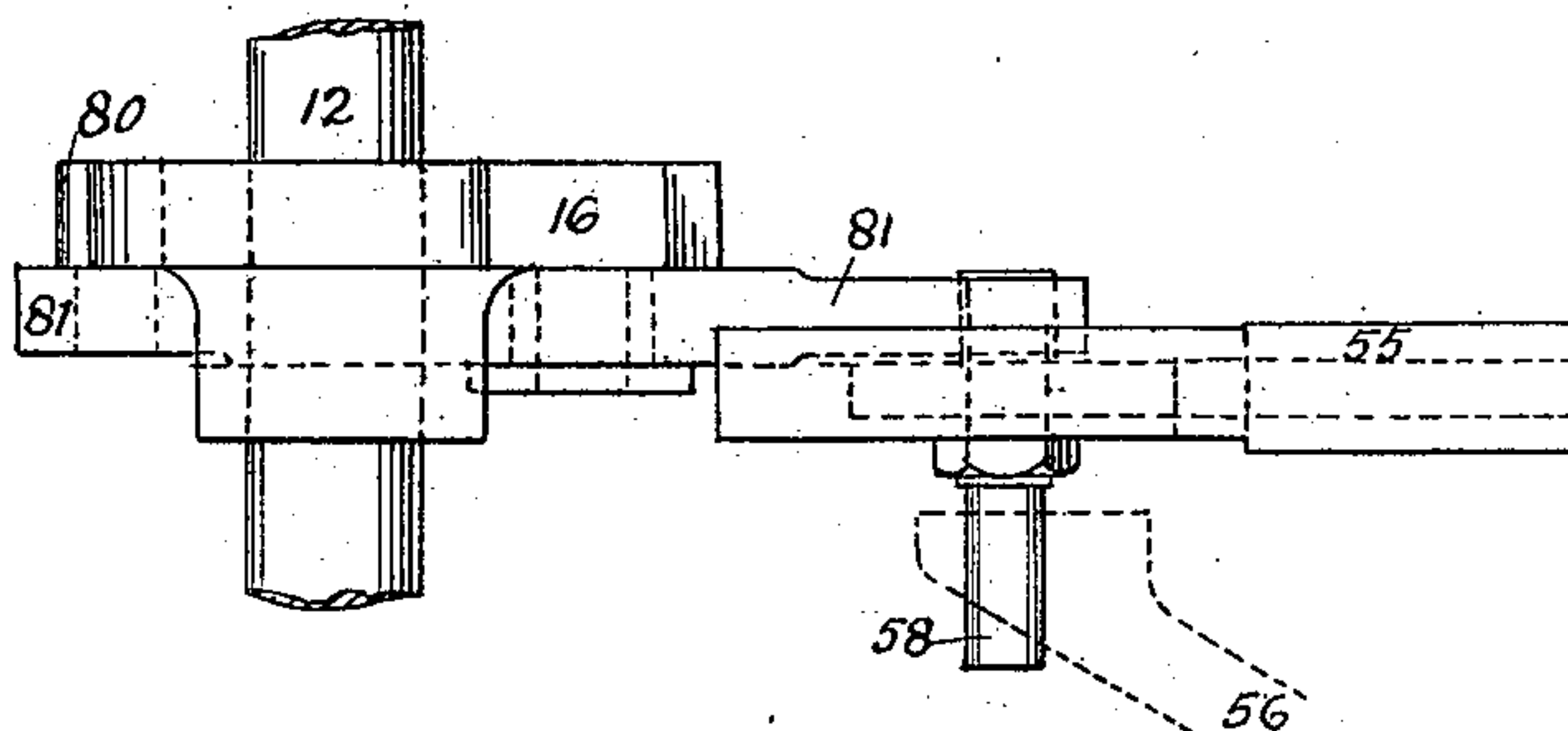


FIG. 6.



Witnesses:

E. H. Holton

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Inventors:

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Luke Dunkerley, Junior

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(No Model.)

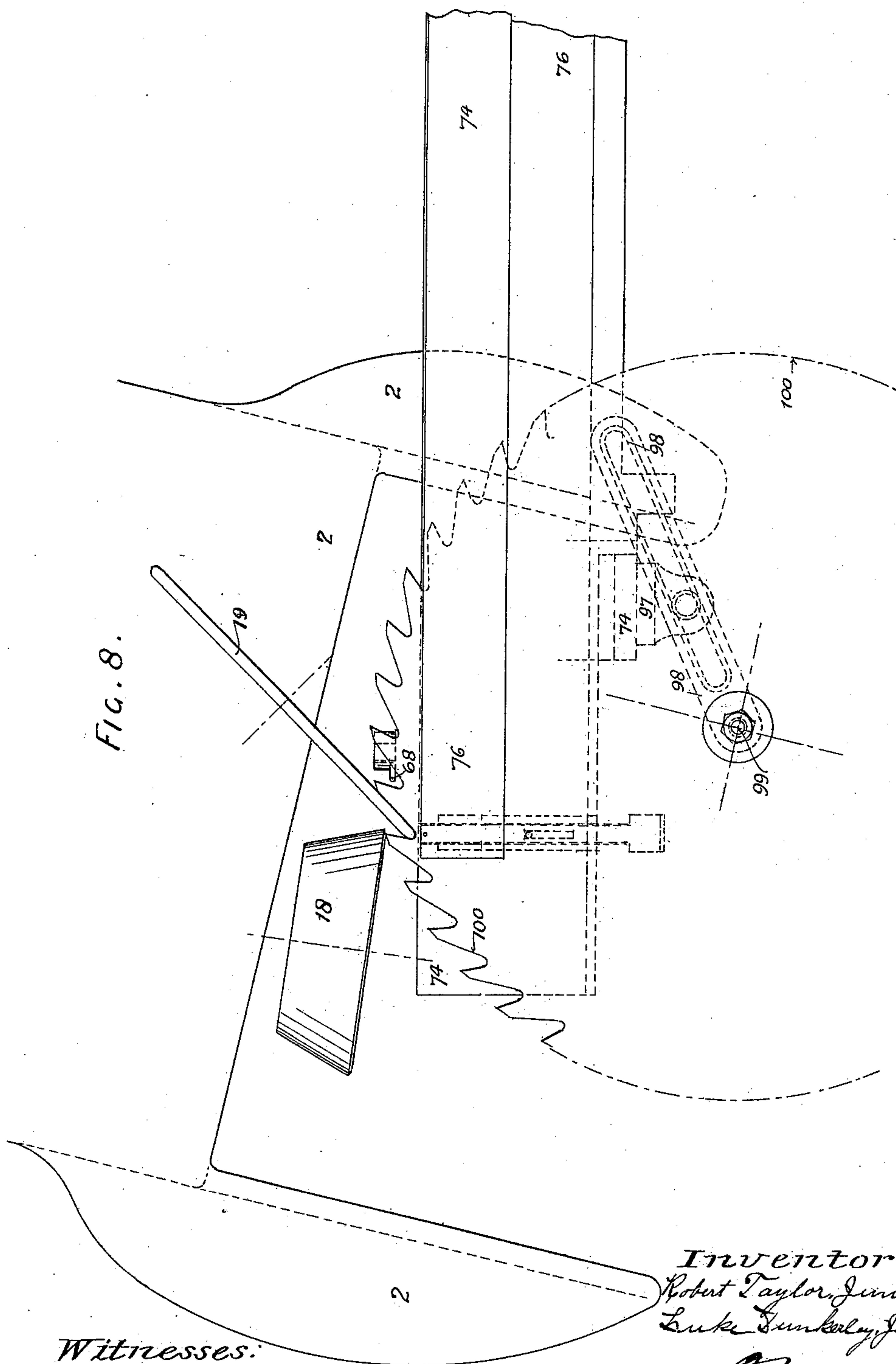
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FIG. 8.



Witnesses:

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UNITED STATES PATENT OFFICE.

ROBERT TAYLOR, JR., AND LUKE DUNKERLEY, JR., OF OLDHAM, ENGLAND.

MACHINE FOR SHARPENING SAWS.

SPECIFICATION forming part of Letters Patent No. 599,114, dated February 15, 1898.

Application filed April 29, 1897. Serial No. 634,458. (No model.) Patented in England May 27, 1896, No. 11,492.

To all whom it may concern:

Be it known that we, ROBERT TAYLOR, Jr., and LUKE DUNKERLEY, Jr., subjects of the Queen of Great Britain, and residents of Oldham, in the county of Lancaster, England, have invented certain new and useful Improvements in Machines for Sharpening Saws, (for which we have obtained Letters Patent in Great Britain, No. 11,492, bearing date 10 May 27, 1896,) of which the following is a specification.

Our invention relates to improvements in saw filing or sharpening machines; and the chief objects of our improvements are to sharpen the face, clear out the gullet, and sharpen the top or back of one and the same tooth simultaneously, and during the time that the emery-wheels are being drawn away after grinding the tooth and before they return into position ready for grinding the next tooth to automatically swivel the carriage of each grinding-wheel and simultaneously feed the saw forward one tooth and also reverse the rotation of the emery-wheels, so that the 15 cutting-wheels will grind the face and top of each tooth at the opposite bevels or angles to the previous one.

In the drawings, Figure 1 is a plan view of the machine. Figs. 1^a, 1^b, 1^c, and 1^d are enlarged plan views of portions of Fig. 1. Fig. 1^e is a view of a detail. Fig. 2 is an elevation showing the driving-shaft and part of the cam-shaft. Fig. 3 is an elevation of the two emery-wheels and their carriages. Fig. 35 4 is a detail view of the cup-shaped emery-wheel and its carriage. Fig. 5 is an elevation, and Fig. 6 a plan, of two of the cams. Fig. 7 is a detail view of the reciprocating pusher for feeding the saw. Fig. 8 is a plan 40 view of an arrangement for grinding circular saws.

In the drawings, 2 indicates the frame or table of the machine, which carries in suitable bearings 3 the main shaft 4, upon which 45 are secured a driving-pulley 5, a pulley 6, keyed upon a bush 7, dotted lines, Fig. 1, loose upon the shaft 4, and a grooved pulley 8, also keyed upon the bush, and between the pulleys 6 and 8 is also mounted a loose pulley 9. Upon the belt-pulley 5 is placed an 50 open belt which drives the machine constantly in one direction, and a crossed belt on

the pulley 6 drives by a band on the grooved pulley 8 the emery-wheels in one direction, and when by a belt-shifting mechanism the 55 crossed belt is moved onto the loose pulley 9 and the open belt is brought onto the pulley 6 the emery-wheels are driven in the reverse direction, this change of rotation taking place after each tooth of the saw has been ground. 60

On the main shaft 4 is keyed a worm 10 in gear with a worm-wheel 11, keyed upon a cam-shaft 12, Fig. 2, upon which are keyed five cams. Of these the cams 13, 14, and 15 65 are double cams, while the cams 16 and 17 are single. The cam 13 is for actuating the slides and carriage upon which a cup-shaped emery-wheel 18 for grinding the top or back of the saw-tooth is mounted, while the cam 14 is for actuating the slides and carriage 70 upon which is mounted a plate-shaped emery-wheel 19 for grinding the face or breast of the same tooth and gulleting and grinding the back of the next tooth. The cam 15 is a face cam with two snugs on it for feeding the saw 75 to be sharpened tooth by tooth. The cam 16 is for tilting the emery-wheel carriages in one direction, the return movement being effected by their own weight, while the cam 17 is employed to move the strap-forks for the driving- 80 belts in one direction, when required, against the resistance of a spring which brings them back.

The carriage for the cup-shaped emery-wheel consists of a plain slide 20, fitted to 85 slide upon two parallel bars 21, secured in the frame 2, and upon the slide 20 is mounted a movable plate 22, which is free to be swiveled at will upon a bolt 23, secured in the slide 20, the center of the bolt 23 preferably 90 corresponding with the point of the saw-tooth when the slide 20 has finished its forward movement and the tooth is in position to be ground. The plate 22 is secured in the desired position upon the slide 20 by bolts 24 95 and a wing-nut on the bolt 23. On the plate 22 are fitted a pair of parallel bars 25, upon which is mounted a slide 26, which has an upright face set at a convenient angle, as shown in Fig. 3. On this upright face is fitted 100 a bracket 27, which swivels on a pin 28, the axis of which is in the same plane as that of the mid-thickness of the saw-blade and is secured in the upright portion of the slide 26.

The plate 22 and the slide 26 are carried by the slide 20, which carries a lever 34, to which is attached a pin 44, resting in the groove of the cam 13. The pin 44 is secured to the lever 34 by a set-screw. (See Fig. 4.) The periphery of the cam 13 moves the slide 20, and the groove in the cam by the pin 44 moves the lever 34, which by its connections draws the slide 26 across the saw-tooth. We prefer to make the pin 44 a separate part for convenience of renewal as the surface in contact with the cam wears. The bracket 27 has four projections which form slideways for a slide 29, the two back snugs being behind the vertical face of 27 and the two front snugs being in front of the vertical face, thus enabling the tail end of the slide 29 to pass through and behind the vertical face of the bracket 27. The spindle 31 of the emery-wheel 18 is carried in the slide 29 and is driven by a band 43 from the grooved pulley 8, passing over a pulley 32, fixed thereon.

To compensate for wear of the emery-wheel 18, the slide 29 can be fed or adjusted toward the saw-blade by a milled wheel and screw 33, the screw passing through a fixed eye on the bracket 27 and into an eye on the slide 29. The lever 34, to which the pin 44 is attached, is centered on a stud 35, carried by the bottom slide 20, and this lever is secured by a bolt 30 in a slot 36 in a connecting-rod 37, which is pivoted to the slide 26 on a stud 38. On a stud 39, secured to the slide 26, is a plate 40, which carries a stud 41, on which are mounted two carrier-pulleys 42 for the band 43. The pulleys also act as tighteners for the band 43, which also passes over other guide-pulleys 92, 93, and 94, Sheets 2 and 5.

The carriage 45 for the emery-wheel 19 is fitted so as to be free to slide as well as to turn in two bearings on the main frame 2 of the machine, and the center of this portion of the carriage is in the same plane as the mid-thickness of the saw-blade and is also in line with the face or breast of a tooth when in the proper position to be ground, and is also the central point of contact of the emery-wheel 19 with the face of the tooth when grinding. The carriage 45 is moved up horizontally toward the saw-tooth by the cam 14 acting against the lowest part of a lever 46, (see Sheet 1 and Figs. 5 and 6,) pivoted on a stud 48, and is drawn back by a spring 49. The adjustment of the carriage 45 to suit different depths of teeth on the saw is effected by means of an adjusting-screw 47, which passes through the lever 46 and acts against a snug on the carriage 45. A bracket 50, provided with two arms, is reduced in diameter at 51, where it is fitted into the carriage 45, Figs 1 and 1^a, and through these arms passes the spindle 52 of the emery-wheel 19, which carries a pulley 91 for the driving-band 43, by which both the emery-wheels 18 and 19 are driven. The position of the bracket 50 and wheel 19 is adjusted by a screw and

hand-wheel 53, and the bracket 50 in the carriage 45 is locked by a nut with a handle 54. The carriage 45 rests by its own weight on a vertical bar 55, (see Fig. 3,) fitted in the bed-plate 2, and one end of a rocking lever 56, centered at 57, is raised by a stud 58, connected to the vertical bar 55, which is actuated by the cam 16, as hereinafter described, so that as the opposite end of the lever 56 is moved downward the lever 56, through a connecting-link 59, draws down one end of a rocking bar 60, which passes through a boss fulcrumed at 61 on the slide 26, and at the other end the lever 60 projects through a slot in the bracket 27. Consequently when the lever 60 is oscillated the bracket 27 swivels on its pivot 28. (See Fig. 4.)

The snugs on the cam 15, Figs. 1 and 1^c, act against the nose of a lever 62, centered at 63, Fig. 1^d, on the bed-plate 2 and cause the lever 62 to move sidewise twice for each revolution of the cam. To one end of the lever 62 is secured a screw 64, the head of which comes against the quadrant end of a lever 65 and moves it along a slideway on a bed 66, on which a table 74 for the saw-blade 67 is fitted in slideways. On the lever 65 and centered on a stud 69 is a pusher 68, (see Fig. 7,) which enters the gullets between the saw-teeth as the lever 65 is moved forward, and on returning the pusher dips or tilts as it comes in contact with the back of the next tooth and regains its working position by the other end of the pusher being the heavier and falling upon a stud 70 on the lever 65.

The bed 66 swivels on a stud 71, from the center of which the quadrant on the lever 65 is struck, and the center of the stud 71 is the point to which the pusher 68 advances the tooth on which it is acting, Sheet 3. This bed can be swiveled in either direction at will, according to the hook or shape required for the face of the saw-tooth, and the pitch of the feed is regulated by a screw 90, Sheet 4, which passes through the frame 2. The pusher and lever 65, as well as the lever 62, are brought back by a spring 72. To the sliding table 74 are secured two adjusting-plates 73 and 95 for setting the saw in position on the table 74 ready for grinding. The plate 73 is mounted directly upon the table 74, while the plate 95 is fitted to be moved along a rod 96 to accommodate different lengths of saws. The saw is clamped down to the table by thumb-screws or bolts 75, of which only one is shown in Fig. 4, pressing a wooden rail 76 onto the saw-blade 67, which rests upon a board secured to the table. The thumb-screws 75 and the wooden rail 76 are carried by brackets 77, mounted on a shaft 78, which is carried in bearings on the table 74.

The cam 16 acts against a stud 80, secured to a rocking lever 81, mounted adjustably on a stud 82, fixed to the main frame 2, Figs. 5 and 6, and forces down the stud 80, thus rocking the lever 81 and forcing up the vertical bar 55, to which it is attached by the stud 58.

Consequently as the cam 16 rotates the bar 55 descends, with the carriage 45 resting thereon as the stud 80 comes upon the small diameter of the cam.

5 The cam 17, Fig. 2, acts upon a lever 83, secured upon a shaft 84, and this lever is held down upon the cam 17 by a spring. (Not shown.) Upon the shaft 84 are also secured the strap levers and guides 85 86 for governing the belts on the pulleys 5 and 6, respectively. Upon the pulley 5 there is an open belt 87, and upon the pulley 6 is a crossed belt 88. When the strap-guide moves the belt 88 onto the loose pulley 9, and the strap-guide 85 simultaneously moves part of the broad strap 87 onto the pulley 6, the motion imparted to the grooved pulley 8 and to the band 43, which drives both emery-wheels, will be reversed, while the strap 87 will continue to drive the machine continuously in the same direction.

In operation when a saw-blade 67 has been clamped upon the board on the table 74 (see Fig. 4) and the emery-wheels have been adjusted to their proper positions relatively to the saw the machine is started and the carriage 45 is moved up by the cam 14, so that the emery-wheel 19 begins to grind the face of the tooth. Meanwhile the slide 20, actuated by the cam 13, has brought up the emery-wheel 18, which traverses across and beyond the point and returns, grinding the top of the tooth, while the emery-wheel 19 travels along and grinds the face of the tooth and gullets and grinds the back of the next tooth. The carriage 45, with the emery-wheel 19, is then drawn back by its spring 49, and the slide 20, with the emery-wheel 18, by springs 89, coiled on the rod 21. Then the cam 15, through the lever 62 and screw 64, moves the quadrant 65, which brings the pusher 68 up to and against the tooth in front of that which has been ground and acting on the saw-tooth moves it as far as the center of the stud 71, in which position the tooth is in the correct position for being ground when the lever 65 and pusher 68 are withdrawn by the spring 72. While this is being done, the carriage 45 is raised by the movement of the bar 55, actuated by the cam 16, to change the position of the emery-wheel 19, and simultaneously the movement of the bar 55 and levers 56, 59, and 60 (see Fig. 4) tilt or oscillate the pivoted bracket 27 and change the position of the emery-wheel 18, so that as the emery-wheels 19 and 18 grind the tooth then in position the angles of the face and top cutting edges will be the reverse of those ground on the previous tooth, and so on at every fresh tooth.

60 The adjustable plate 22, which is fastened to the bottom slide 20, can be loosened at the points 23 24, and also the connecting-bar 37 by loosening the bolt 30 can be moved at will, carrying the emery-wheel 18 with it, thus altering the angle of grinding of the top of the tooth and making it more obtuse or acute, as required. The center 23, from which the

plate 22 swivels, is preferably identical with the point of the tooth when the bottom slide 20 has received its full forward movement. 70

Referring to the driving mechanism, the main shaft 4 of the machine is driven constantly in one direction by the open belt 87. The emery-wheels are driven in two directions. They are driven in one direction when the crossed belt 88 is on the pulley 6 and in the opposite direction when the open belt 87 is on the pulley 6 and the crossed belt 88 is on the loose pulley 9. Consequently the pulley 6, which is fixed on the sleeve 7, runs in two directions, according as to whether it is driven by the open belt 87 or the crossed belt 88, and this motion is transmitted from the pulley 8 (also fixed on the sleeve 7) by a band 43 to the emery-wheels, which are thus driven first in one direction and then in the other, while the machine continues running constantly in one and the same direction. 80 85

In Fig. 8 we illustrate an arrangement for grinding circular saws. A bracket 97 is bolted to the table 74, and to this bracket 97 is secured an adjustable slotted bar 98, in which is mounted a stud 99 to receive the eye or center of a circular saw 100. The saw-blade rests upon the table 74 and is set in position in the same manner as a straight saw by means of the plate 73, Sheet 3, so that the pusher 68 acts upon the teeth successively and feeds the saw around after each tooth has been ground simultaneously by the wheels 18 and 19, the saw being steadied by the wood rail 76 and the table 74 remaining stationary. 90 95 100

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim, and desire to secure by Letters Patent of the United States, is— 105

1. In a saw-sharpening machine, the combination of a grinding-wheel to grind the face of one tooth, a second grinding-disk to grind off the top of the same tooth simultaneously with the action of the first disk, said disks being automatically adjustable transversely of the saw to vary the lateral angle of contact with the saw, the tilting and movable supports for the said grinding-wheels with means for automatically tilting the said supports to change the angle of the grinding-disks laterally relative to the saw, substantially as described. 110 115 120

2. In combination, the two grinding-disks, one to act on the face of the saw-tooth while the other acts on the crown of the same tooth, adjustable to vary the lateral angle of contact with the saw, automatic means carrying the grinding-disks and for tilting the same, means for feeding the saw step by step and means for retracting and advancing the grinding-disks to make them act in succession and simultaneously on the teeth of the saw in consecutive order, the tilting of the grinding-disks being done between the grinding actions, to vary the lateral angle of contact be- 125 130

tween the disks and saw, substantially as described.

3. In combination, the grinding-disk for sharpening the top of the tooth, a grinding-disk for simultaneously grinding the face of the same tooth, gulleting the same and grinding the back of the next tooth, said disks being adjustable to vary their lateral angle of contact with the saw, means for advancing and retracting the grinding-disks and for reversing their inclinations between the grinding actions, said grinding-disks acting on the teeth in consecutive order and at different inclinations alternately and laterally in relation to the saw, substantially as described.

4. In combination, the grinding-disks, a support therefor for automatically changing the inclination of said disks and means for reversing the direction of rotation of the disks between the grinding actions, substantially as described.

5. In combination, a pair of grinding-disks

operating simultaneously on the same tooth, means for advancing and retracting said disks to and from the work, means for changing the inclination of the disks between the grinding actions and means for reversing the direction of rotation of the disks between the grinding actions and means for feeding the saw step by step, substantially as described.

6. In combination, a grinding-disk, means for changing the inclination of the same relatively to the saw-teeth, and reversing driving mechanism to change the direction of rotation of the disk to leave the bur on the inside or inoperative edge of the tooth, substantially as described.

. In witness whereof we have hereunto set our hands in presence of two witnesses.

ROBERT TAYLOR, JUNIOR.

LUKE DUNKERLEY, JUNIOR.

Witnesses:

H. B. BARLOW,

S. D. GILLET.