No. 681,715. Patented Sept. 3, 1901.

M. E. LAYNE.

MACHINE FOR TAMPING CONCRETE.

(Application filed Feb. 25, 1899. Renewed Feb. 5, 1901.)

(No Model.) 4 Sheets—Sheet 1.

Fig. 1.

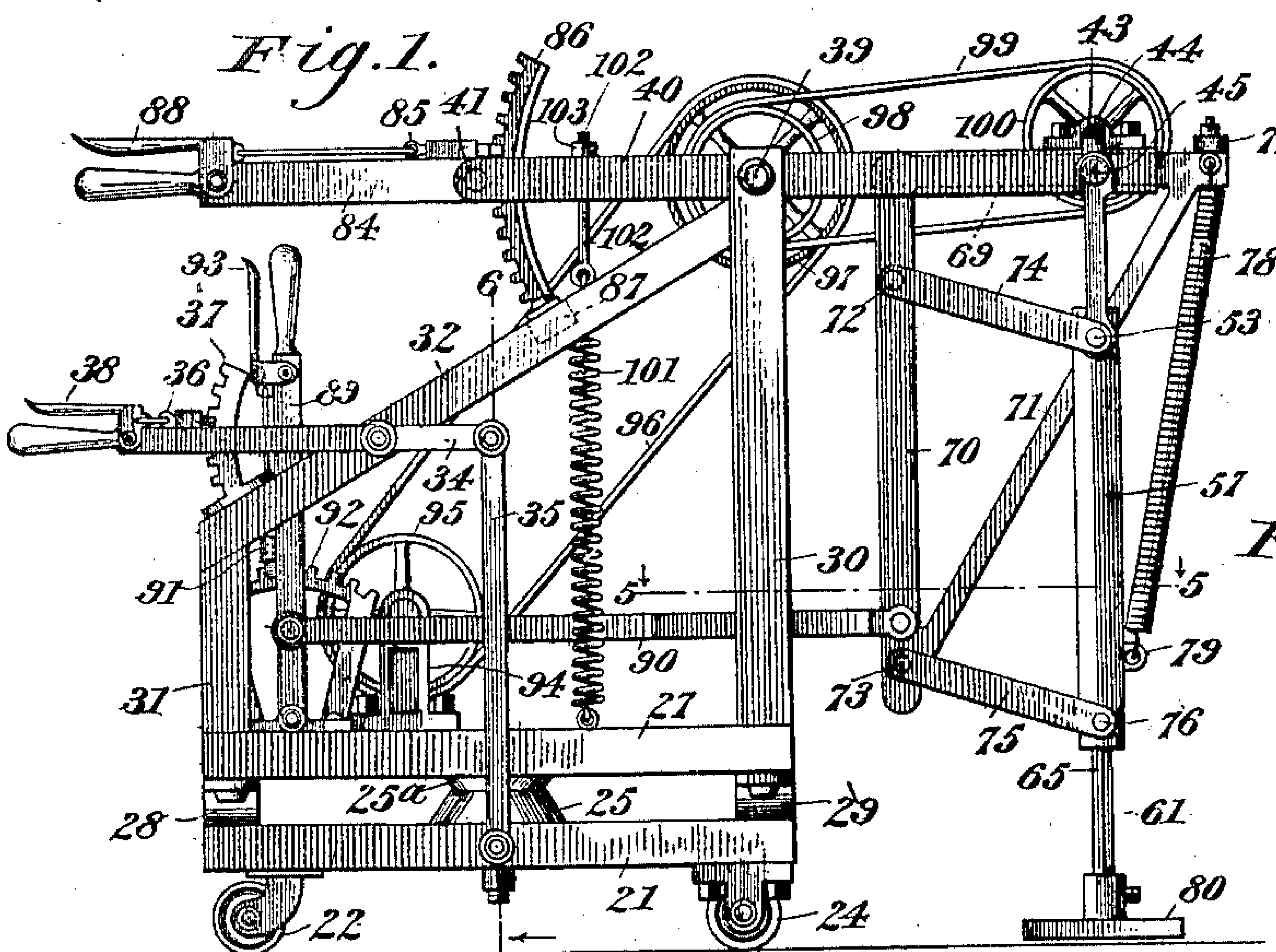


Fig. 7.

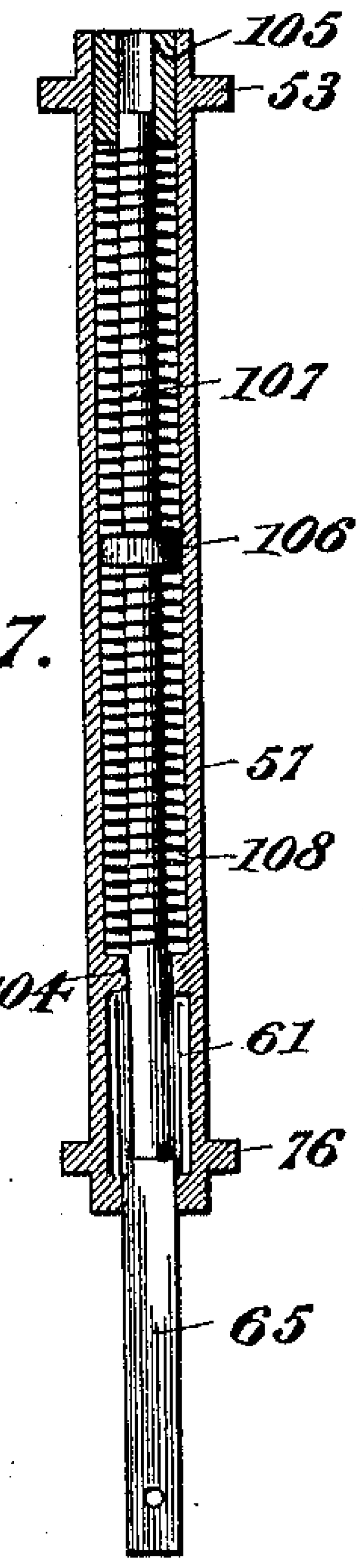


Fig. 2

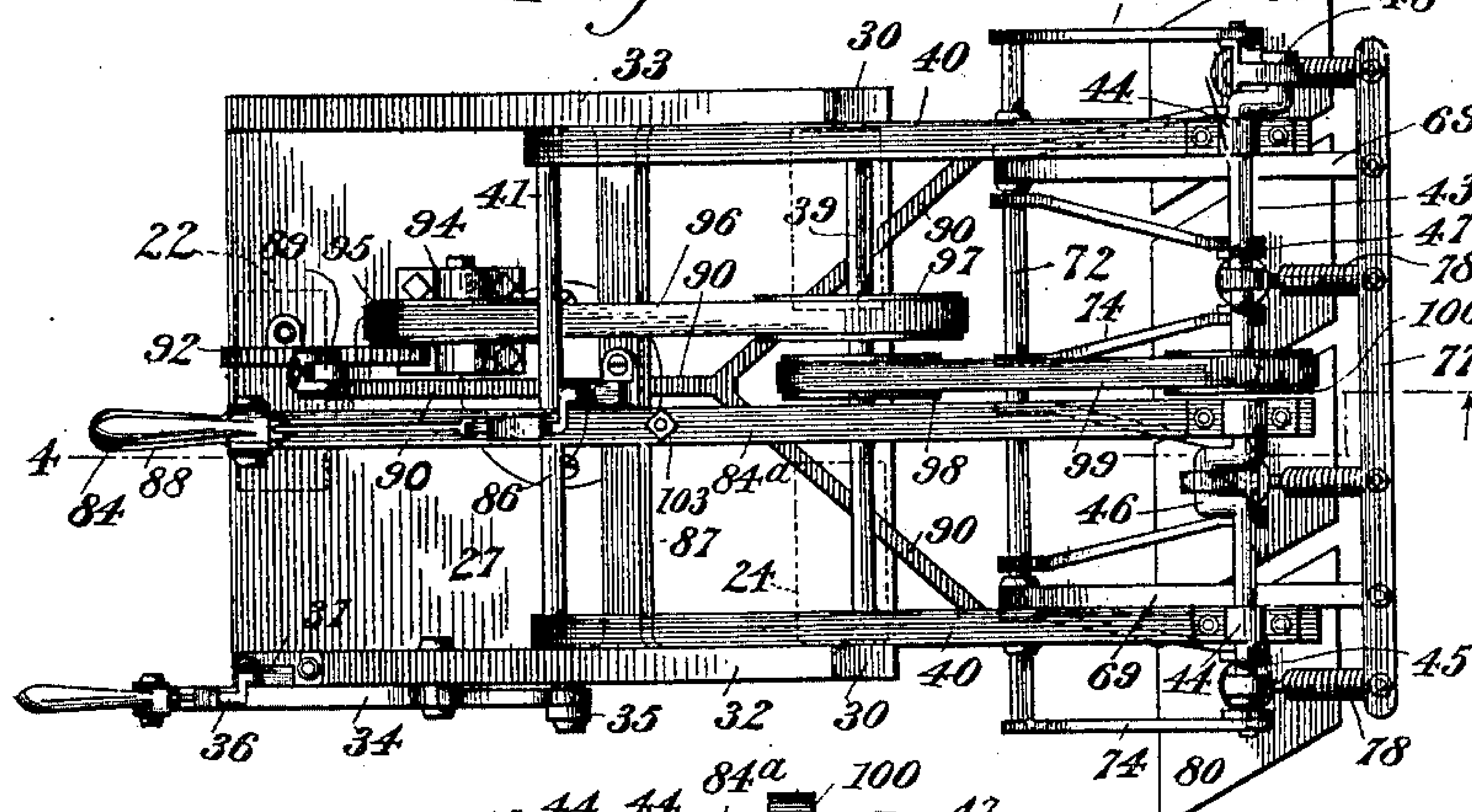


Fig. 8.

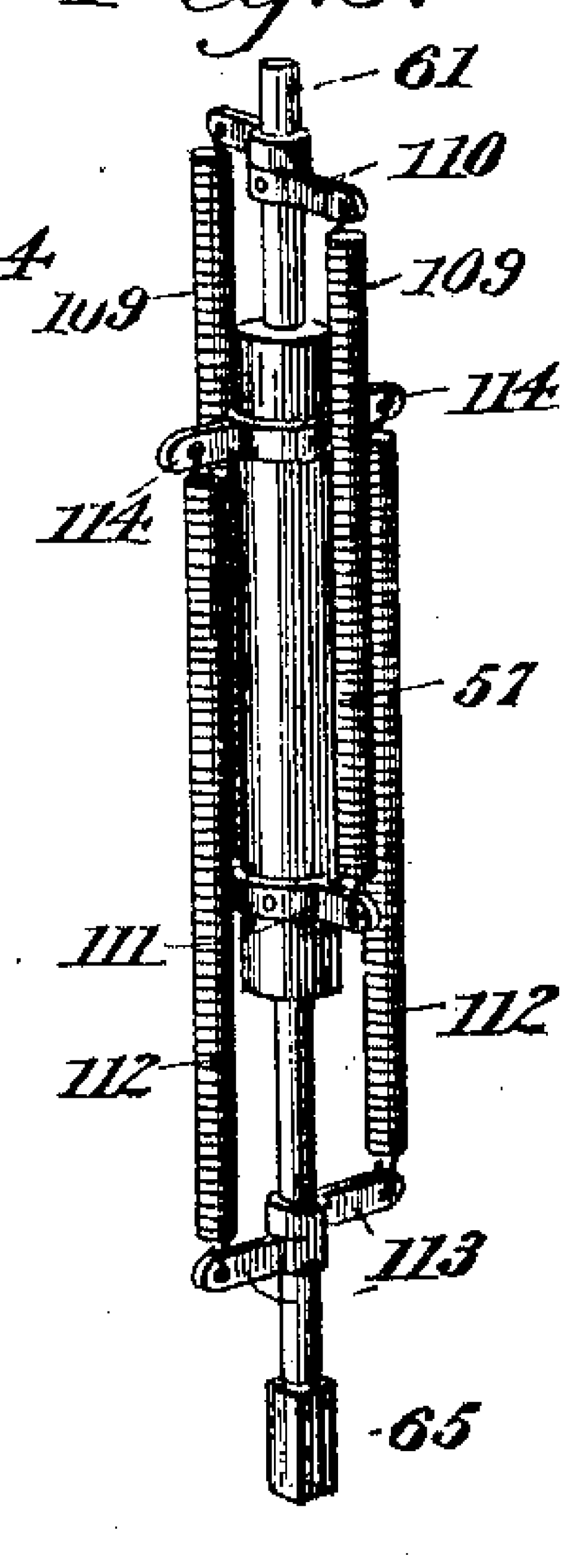
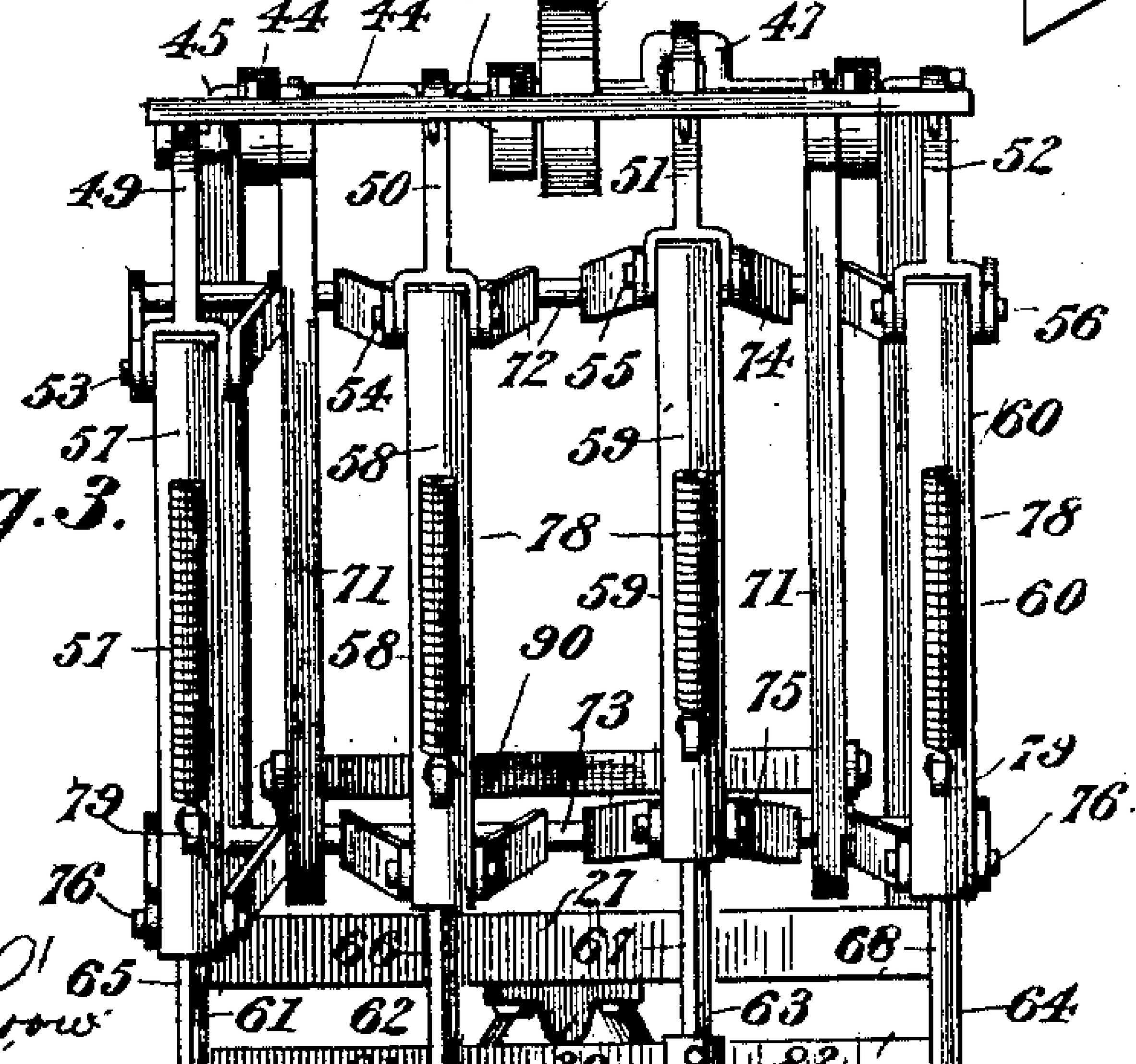


Fig. 3.



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(No Model.) 4 Sheets—Sheet 2.

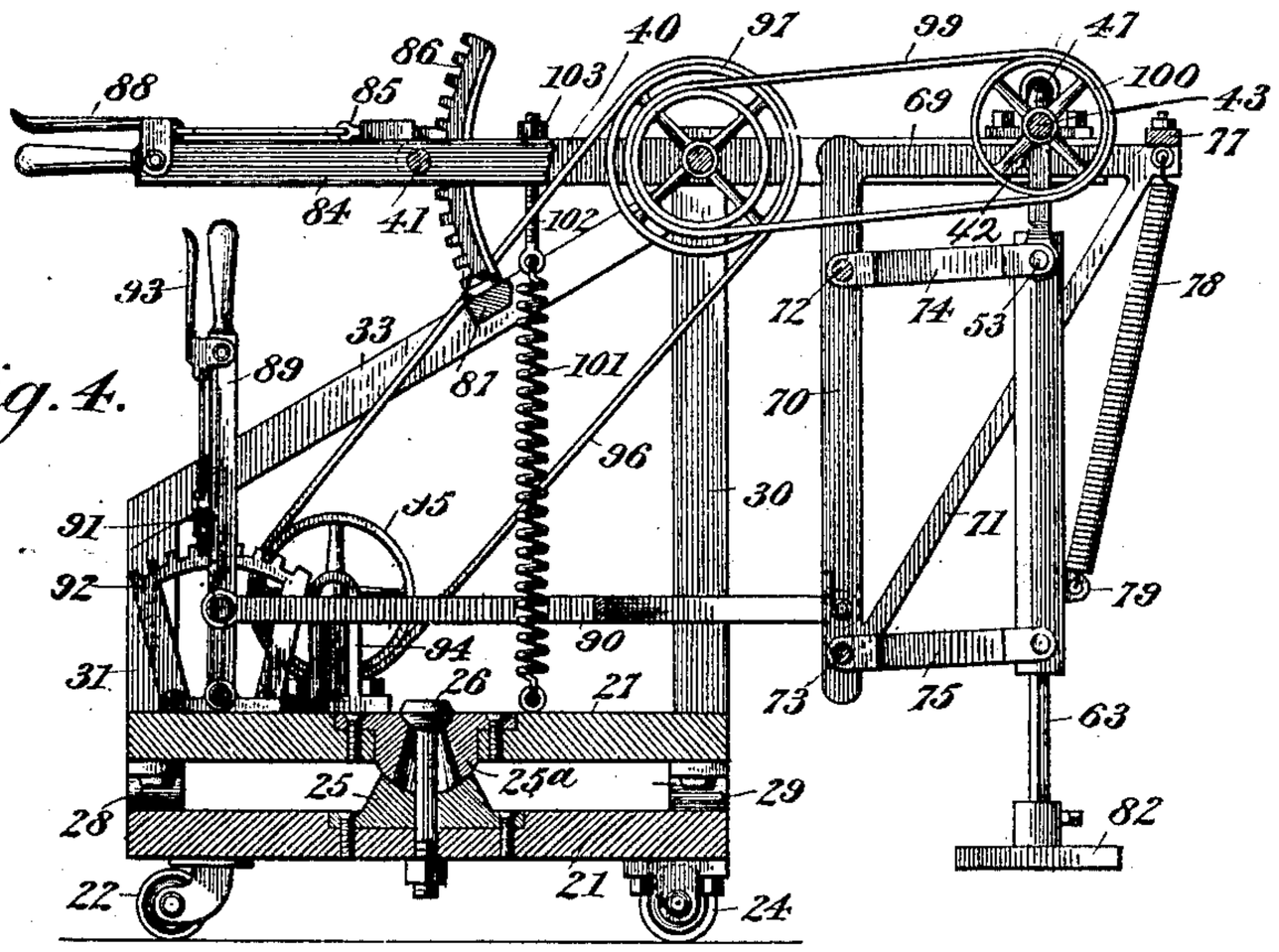


Fig. 4.

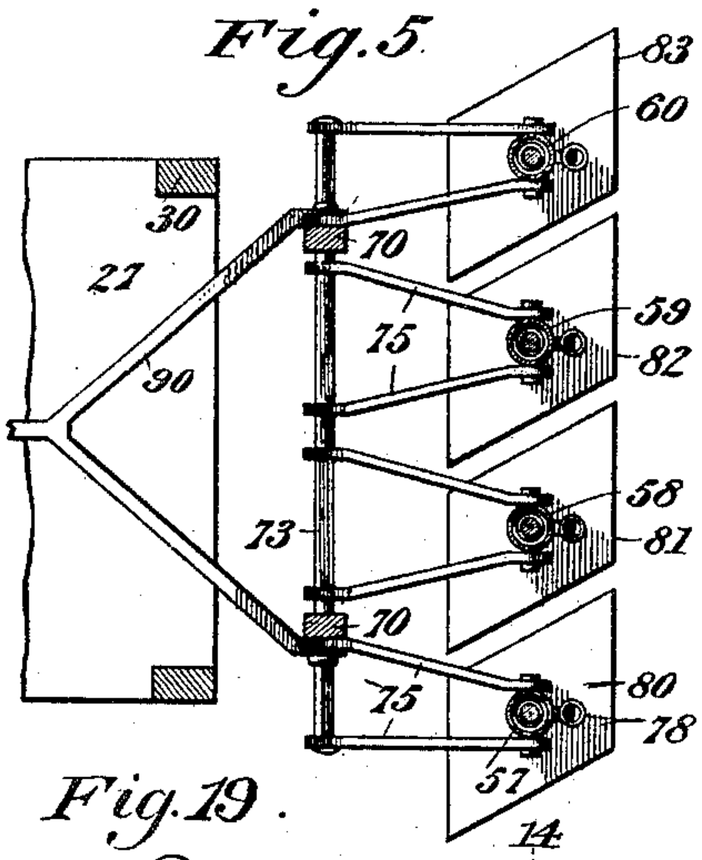


Fig. 19.

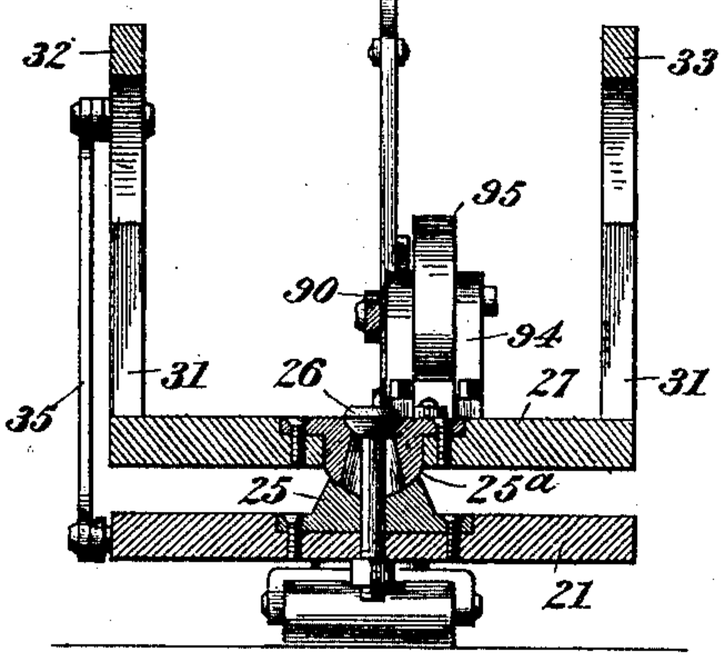
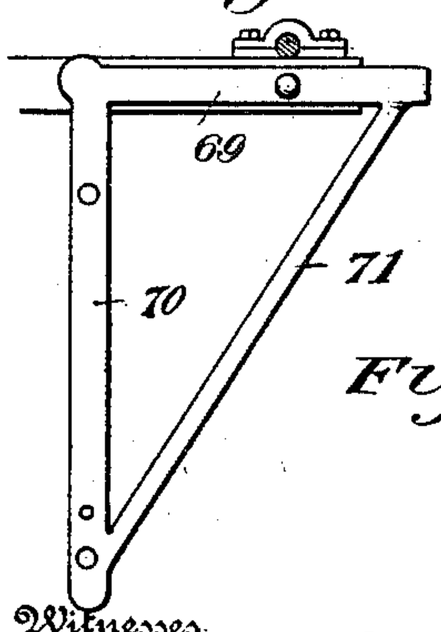


Fig. 5.

Fig. 6.



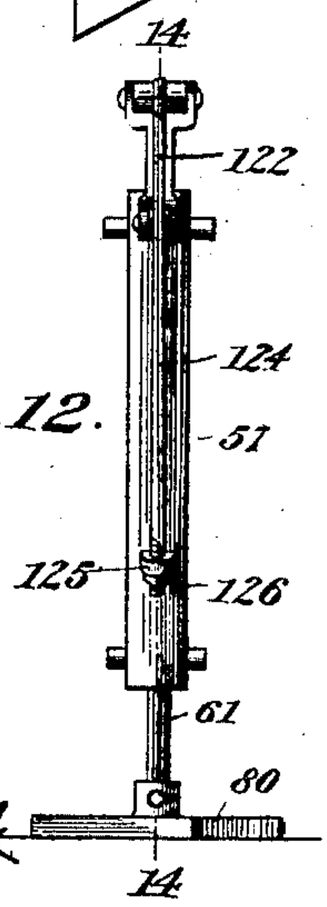


Fig. 12.

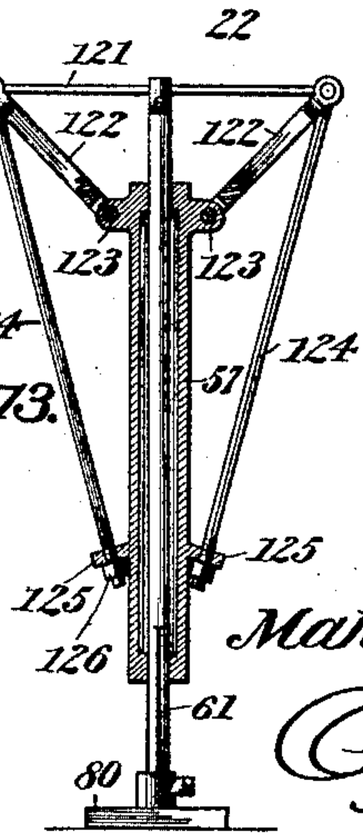


Fig. 13.

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(No Model.) 4 Sheets—Sheet 3.

Fig. 9.

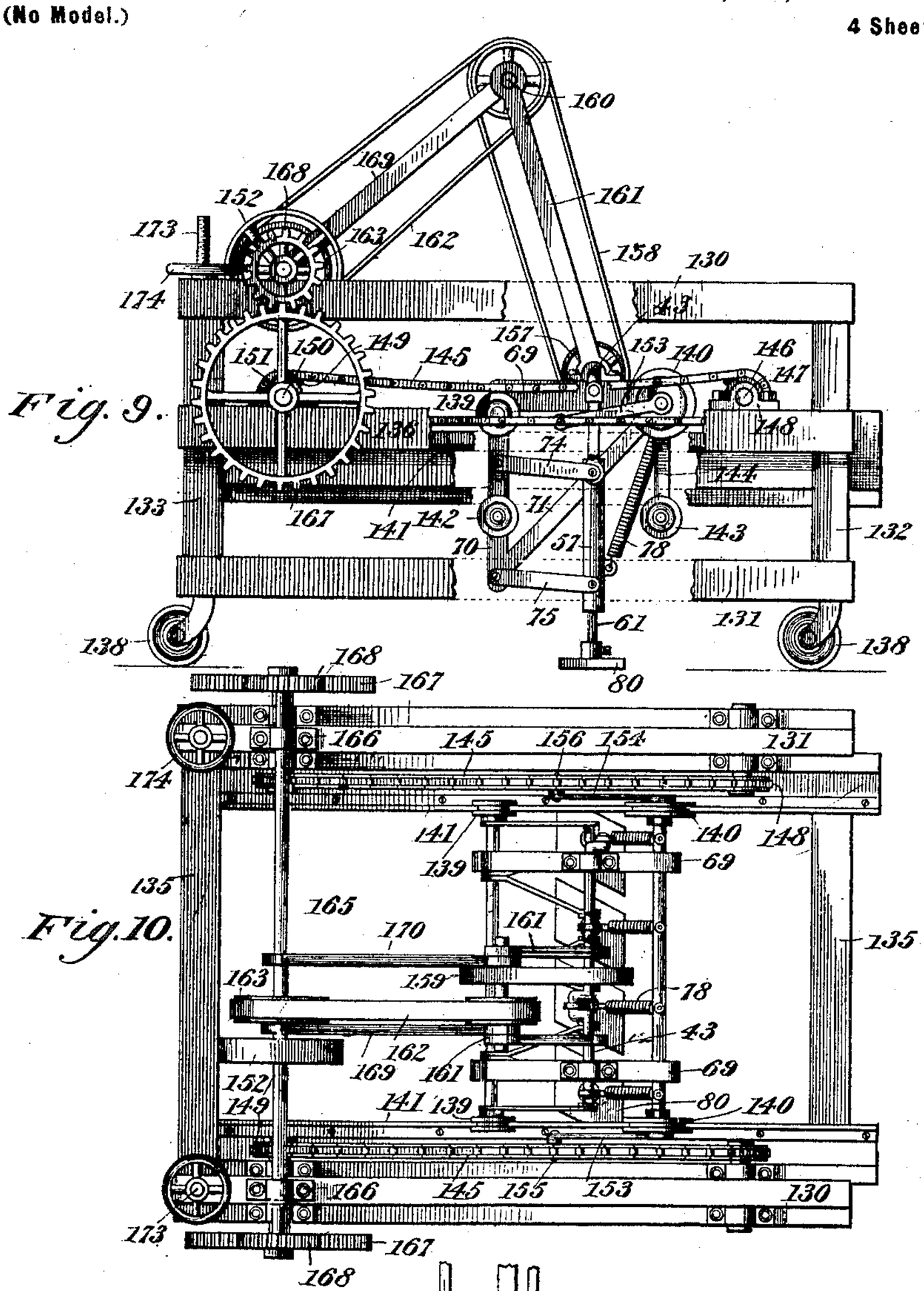
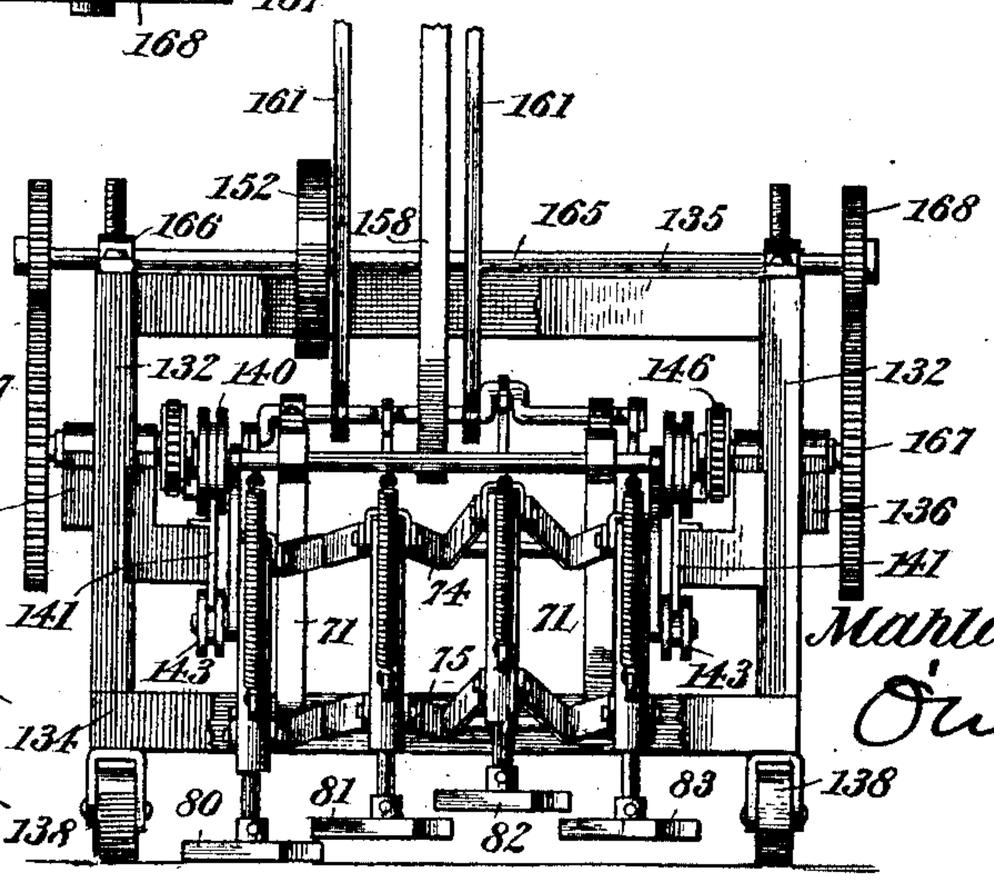


Fig. 10.



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(No Model.) 4 Sheets—Sheet 4.

Fig. 14.

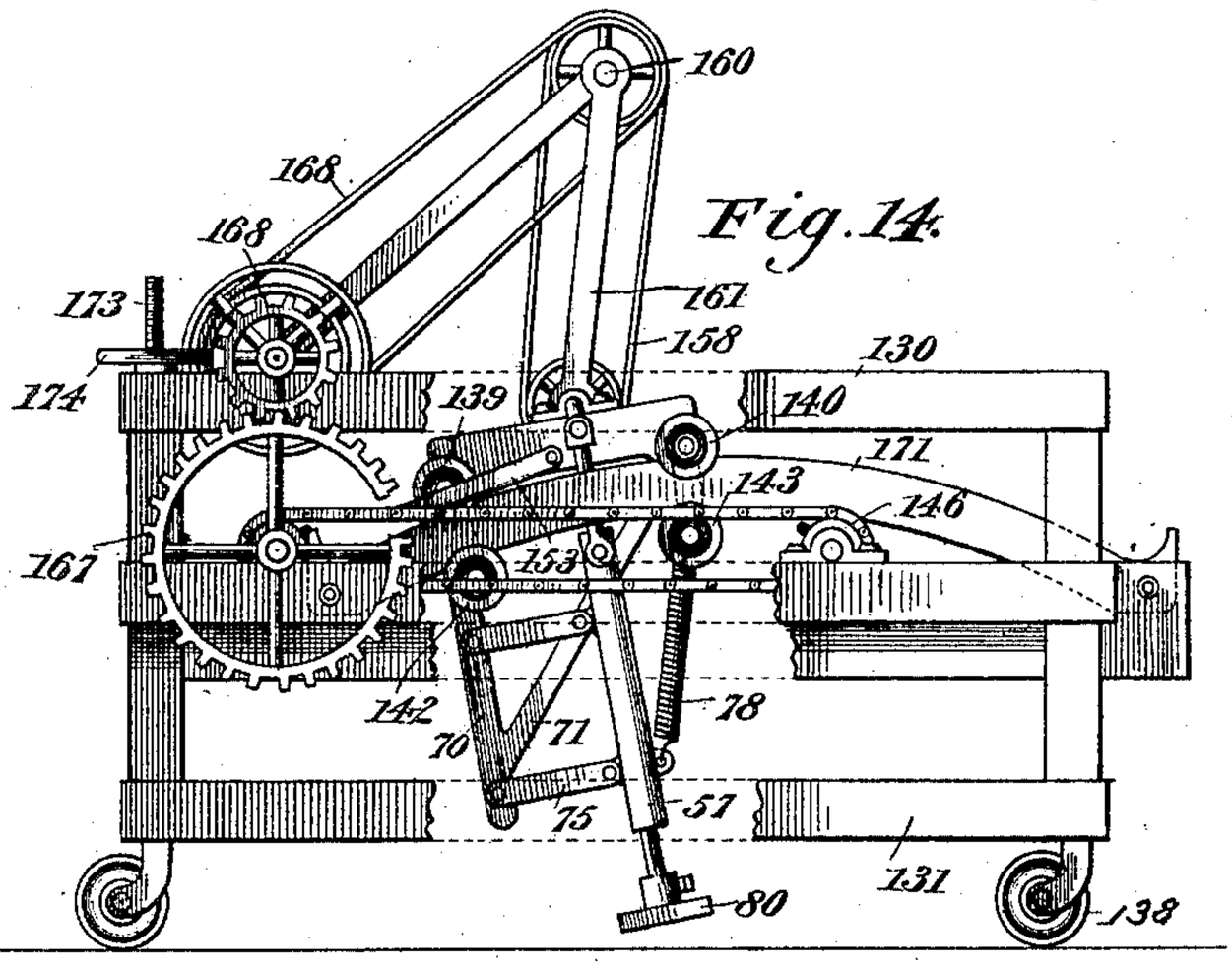


Fig. 15.

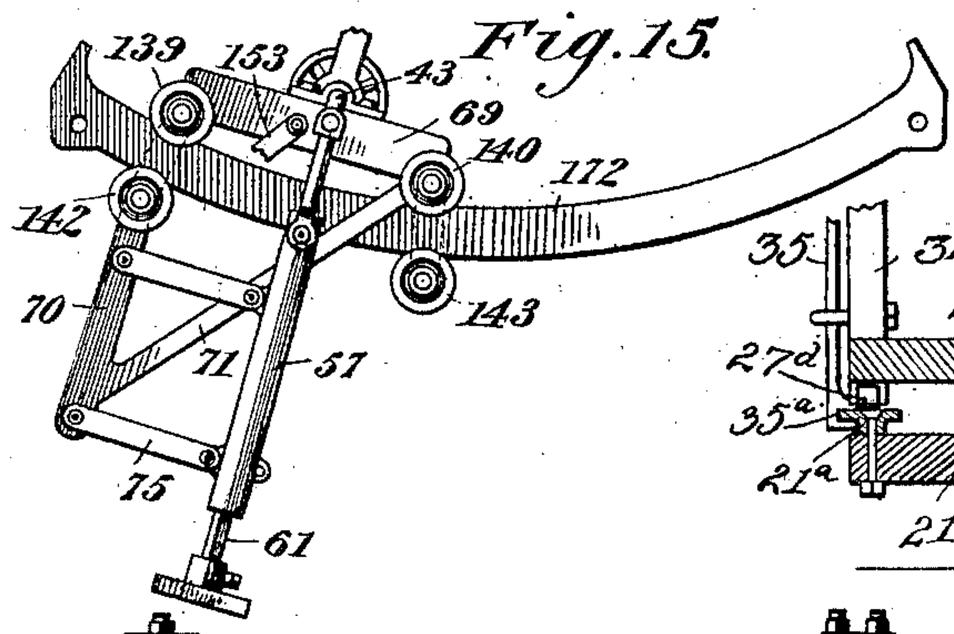


Fig. 18.

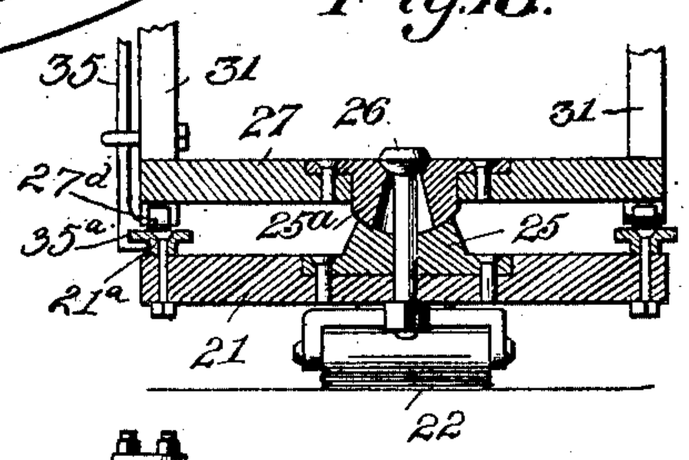


Fig. 16.

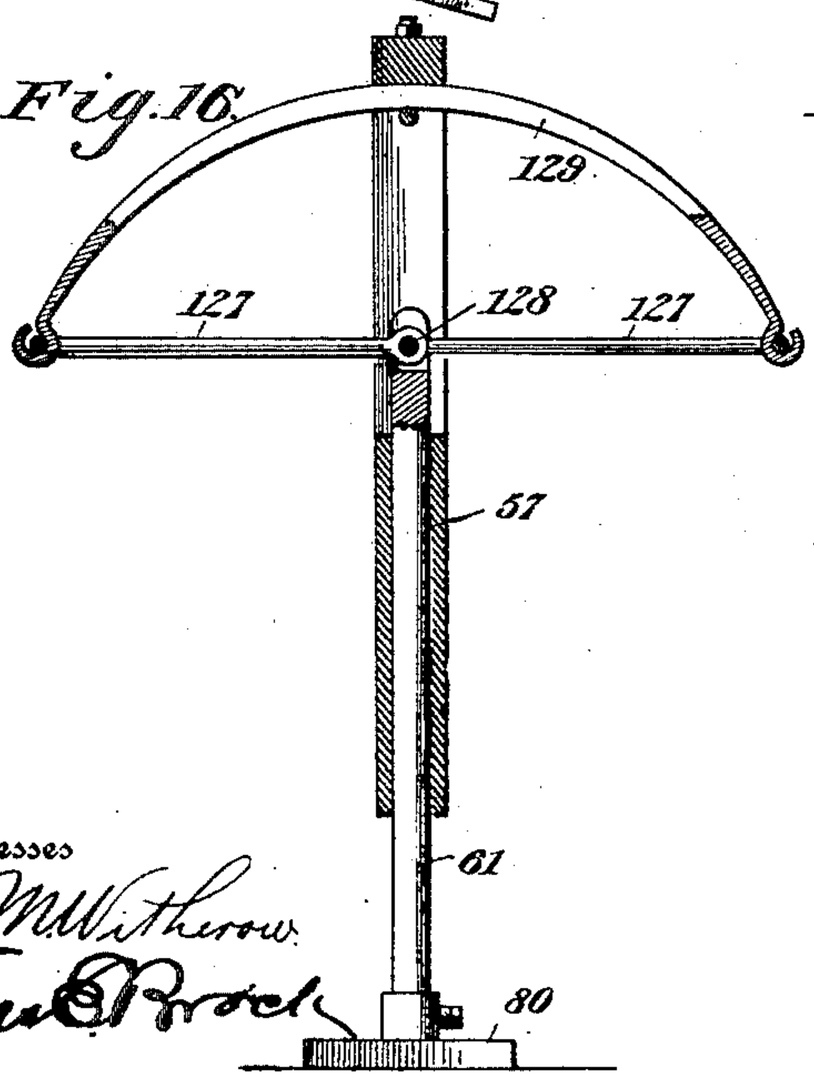
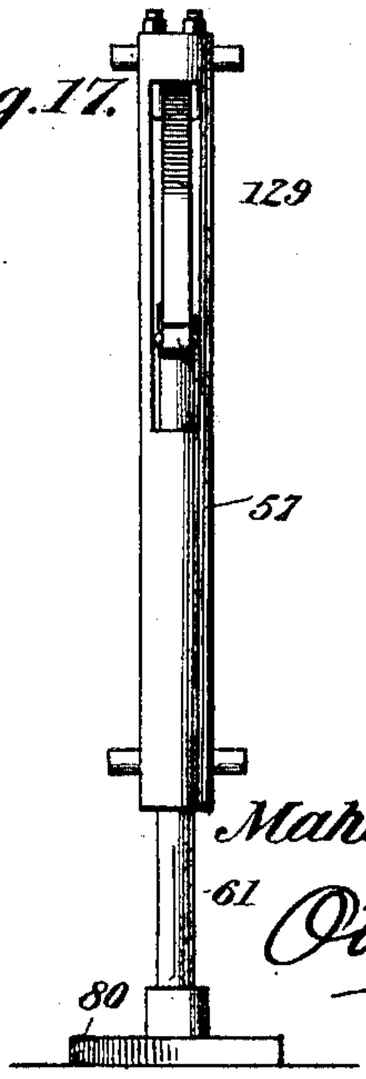


Fig. 17.



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UNITED STATES PATENT OFFICE.

MAHLON E. LAYNE, OF ROCK RAPIDS, IOWA.

MACHINE FOR TAMPING CONCRETE.

SPECIFICATION forming part of Letters Patent No. 681,715, dated September 3, 1901.

Application filed February 25, 1899. Renewed February 5, 1901. Serial No. 46,150. (No model.)

To all whom it may concern:

Be it known that I, MAHLON E. LAYNE, a citizen of the United States, residing at Rock Rapids, in the county of Lyon and State of Iowa, have invented a new and useful Machine for Tamping Concrete, of which the following is a specification.

The great difficulty attending the construction of a successful machine for tamping concrete walks, pavements, and the like has arisen from the fact that the work is not always regular and level, but is very often convex, concave, or curved and very often irregular in profile or outline, or both. Further than this, the foundation for the concrete is irregular, and often foreign material in the concrete renders it difficult to tamp regularly.

The object of this invention is to provide tamping machinery which will be adapted to all kinds and qualities of concrete-ware and which will do equally good work upon regular or irregular work, whether intended to be level, concave, convex, or otherwise curved in either elevation or outline, the stroke of the tamping-hammer being so cushioned as to avoid all jar or injury, whether raised or lowered surfaces underlie it at the time of its stroke or whether there be nothing under it sufficiently high to be struck.

With this object in view the invention consists in improved tamping machinery the construction, arrangement, and combinations of the various parts of which will be hereinafter fully described and the specific points of novelty of which will be particularly set forth in the claims.

In order to enable others skilled in the art to which my invention most nearly appertains to make and use the same, I will now proceed to describe its construction and operation, having reference to the accompanying drawings, forming part hereof, in which—

Figure 1 is a view in a side elevation of a tamping-machine constructed in accordance with my invention in which the whole machine is intended to be moved over the work. Fig 2 is a top plan view thereof. Fig. 3 is a front end elevation thereof with parts broken away. Fig. 4 is a vertical longitudinal section through the same, taken on the line 4 4 of Fig 2, looking in the direction of the arrows. Fig. 5 is a detail horizontal sectional view on the line 5 5 of Fig. 1 looking downward. Fig. 6 is a detail vertical sectional view on the line 6 6 of Fig. 1 looking in the direction of the arrows. Fig. 7 is a vertical sectional view through one of the tamping hammers or plungers and its casing of Fig. 1 and its similar figures, the cushioning-springs surrounding the plunger inside of the casing. Fig. 8 is a detail view in elevation, illustrating another arrangement of the tamping hammer or plunger and its casing, the cushioning-springs being outside of the casing. Fig. 9 is a view in side elevation, with parts broken away, illustrating a tamping-machine constructed in accordance with my invention in which the tamping mechanism is moved back and forth on the frame of the machine, which while capable of being moved from place is intended to be stationary until a section of work is thoroughly tamped. Fig. 10 is a top plan view of the machine shown in Fig. 9. Fig. 11 is a front end elevation of the same with parts broken away. Fig. 12 is a detail view in elevation, showing other means for suspending and cushioning the tamping-hammers. Fig. 13 is a detail vertical sectional view of the same on the line 14 14 of Fig. 12. Fig. 14 is a view in side elevation, with parts broken away, of the machine illustrated in Figs. 9, 10, and 11, showing the track upon which the tamping mechanism moves to and fro curved upward at the center to adapt the machine for operation upon convex or upwardly-curved work. Fig. 15 is a fragmentary detail view, in side elevation, showing the track curved downward at the center to adapt the machine for operation upon concave or downwardly-curved work, such as gutters, &c. Fig. 16 is a detail vertical sectional view of another form of mechanism for suspending and cushioning the tamping-hammers. Fig. 17 is a view of the same in side elevation. Fig. 18 is a sectional view, on the same plane as Fig. 6, showing a slight modification in the means for connecting the base and turn-table. Fig. 19 is a detail view illustrating the manner of pivoting the triangular frame for adjusting the angle of the hammers.

Like numerals of reference mark the same parts in all the various figures of the drawings.

Referring particularly to Figs. 1 to 6 of the

drawings, 21 indicates the base of the machine, which is mounted on rollers 22, 23, and 24, the rollers 22 and 23 being at the front and the roller 24 at the rear. These rollers are each a little more in length than one-third of the width of the machine, the rollers 22 and 23 being mounted at the sides of the front and the roller 24 at the center of the rear of the base, the last-named roller overlapping the edges of the space between the two former, the object of this arrangement being to thoroughly roll the tamped work as the machine is propelled over, the weight of the machinery and motor superimposed on these rollers and the base, as hereinafter explained, being sufficient for accomplishing this purpose. The machinery is thereby caused to perform the double function of a tamping-machine and roller.

In the center of the base 21 is an upwardly-projecting casting 25, upon which is mounted a casting 25ª, depending from the center of a turn-table 27 and secured by a king-bolt 26, (see Figs. 4 and 6,) said castings forming the journals upon which the turn-table may be rotated, the turn-table being further supported upon the base by depending fulcrum-blocks 28 and 29, located, respectively, at the front and rear of the turn-table diametrically opposite each other and resting upon the upper surface of the base.

30 and 31 indicate front and rear corner-uprights rising from the turn-table, the uprights on each side being connected by an upper side beam, as at 32 and 33, inclining downwardly from front to rear. Upon the side beam 32 is pivoted a substantially horizontal hand-lever 34, connected at its front end by a bar or rod 35 with the base 21. By raising or lowering the front end of this lever the turn-table and all the parts supported thereon may be tilted on the fulcrum-blocks 28 and 29, thereby regulating the lateral inclination of the machinery with relation to the base. This lateral adjustment is fixed when desired by means of a spring-actuated pawl 36, normally engaging a curved toothed rack 37, secured upon the upper side beam 32, said pawl being withdrawable during the act of adjustment by a finger-lever 38, secured to the hand-lever 34. The turn-table may be provided with a flanged track 21ª, as shown in Fig. 19, on which will bear rollers 27ᵈ on the bottom of the frame 27. In such arrangement the bar or rod 35 will be provided at its lower end with a notch 35ª to fit on said flanged track, so that the adjustment of the frame on the turn-table will not interfere with the action of rod 35.

At the upper ends of the two front corner-uprights 30 is journaled a cross rod or shaft 39, which passes through the side bars 40 of a rectangular frame and serves as a pivotal support for said frame. These side bars are further connected at their rear ends by a cross-rod 41. At their extreme front ends a crank-shaft 43 is journaled in bearings 44 and formed with cranks 45, 46, 47, and 48, each bent at a different angle, upon each of which is a pitman, as at 49, 50, 51, and 52, which at its lower end is connected pivotally upon trunnions projecting laterally, as at 53, 54, 55, and 56, from tubular casings 57, 58, 59, and 60, in which are mounted plungers 61, 62, 63, and 64, which may be of round or any other suitable sectional outline where they pass out at the top of their casings, but which must be square or of some shape to prevent axial turning where they pass out at the bottom of the casings, as at 65, 66, 67, and 68.

Mounted upon pivotal points 42 are two triangular frames composed of horizontal arms 69, vertical arms 70, and diagonal braces 71, connecting the front ends of the horizontal arms with the lower ends of the vertical arms. A cross-rod 72, mounted in vertical arms 70, is connected by loosely-pivoted arms or links 74 with the trunnions 53, 54, 55, and 56 and the cross-rod 73 by similar arms or links 75 with trunnions 76, projecting from the casings 57, 58, 59, and 60. The front ends of the horizontal arms 69 carry a cross-bar 77, and springs 78 connect this cross-bar with eyes 79 on the casings near their lower ends. At their lower ends the plungers carry removable tamping-hammers 80, 81, 82, and 83, which are in outline of the shape known as "diamond," with their points overlapping, as shown, whereby when the machine is moved forward all the work passed over will be tamped and no ridges will be left between the hammers. The frame which supports the hammers and connected mechanism may be raised or lowered by oscillating the side bars 40 on its pivotal support. This is effected through the medium of a hand-lever 84, secured to the rear end of a beam 84ª, centrally mounted in the frame, and which is held in any adjusted position by means of a spring-actuated pawl 85, engaging a curved rack 86, secured to a cross-bar 87, which connects the upper side bars 32 and 33, the pawl being withdrawn from such engagement when desired by means of a finger-lever 88, pivoted to the hand-lever 84.

The swinging frames, before described, may be swung on their pivotal support by means of a hand-lever 89, pivoted to the turn-table connected to the vertical arms 70 of the frame by a Y-shaped bar 90 and held in an adjustment by means of a spring-actuated pawl 91, which engages a curved rack 92, secured to the turn-table, the pawl being withdrawn when desired by means of a finger-lever 93, pivoted to the hand-lever.

94 indicates a steam-engine or any other suitable motor mounted on the turn-table 27 and provided with a band-pulley 95, connected by a band or belt 96 to a band-pulley 97 on the cross-shaft 39, which carries another band-pulley 98, connected by a band or belt 99 to a band-pulley 100 on the crank-shaft 43, whereby the crank-shaft is rotated from the motor and the hammers caused to

be actuated one after the other through the medium of the pitman connecting the casings with the several cranks arranged at various angles to the shaft, as before set forth.

The hammer-carrying frame is connected in the rear of its pivotal shaft 39 to the turn-table 27 by means of a spring 101, attached at its lower end to the turn-table and at its upper end to the lower end of a bolt 102 through the beam 84ª of the frame and adjustably held by a nut 103, threaded upon its upper end above the beam.

In operating my invention as thus far described the tamping-hammers are consecutively actuated by the cranks, no two of them striking at the same time, thus equalizing the expenditure of power and avoiding excessive strain. The adjustment provided for by the hand-lever 34 and its connecting mechanism enables the operator to cause the tamping-hammers to properly operate upon work inclined laterally from the line of movement of the machine, while the adjustment due to the operation of hand-lever 89 and connecting mechanism brings the hammers in position to properly tamp work inclined upward or downward in the line of movement of the machine. The length of the stroke of the hammers being always the same, to properly tamp high or low work the adjustment provided by hand-lever 84ª and its connections is utilized. The tamping-hammer casings are guided in moving up and down by the links 74 and 75. The spring 78 counterbalances to a large extent the weight of the hammers after each stroke, thus rendering the operation of the machine more regular and easy.

In Fig. 7 I have shown another means for cushioning the stroke of the hammers. In this construction the casing 57 is provided with the trunnions 53 and 76, as in the hereinbefore-described construction, and is partially closed by a perforated or bored diaphragm 104 and an adjustable sleeve 105 at its upper end. The plunger 61 is squared, as before described, at 65, and is provided or formed with a rigid collar 106. A spring 107 is coiled around the plunger between the collar end and the diaphragm 104. When the casing is reciprocated by the crank and pitman, the collar 106 is cushioned in both directions by the springs 107 and 108, thus preventing heavy jars or strains during the operation of the machine. The same result is attained in the construction shown in Fig. 8, in which the springs are outside the casing, springs 109 connecting arms 110, secured upon the plunger 61, with arms 111, secured upon the casing 57, and springs 112 connecting arms 113, secured to the plunger 61, with arms 114, secured to the casing 57, the springs 109 cushioning during the upward and the springs 112 during the downward movements.

In Figs. 12 and 13 the hammer 80 is carried by the plunger 61 in casing 57, the plunger being provided at its upper end above the casing with an eye through which a band or strap 121 is passed, the ends of the strap being secured to the outer ends of arms 122, pivoted to lugs 123 on the casing near its upper end. The outer ends of the arms 122 are connected to the casing by rods 124, passing through lugs 125 on the casing near its lower end, and held adjustably therein by nuts 126, by means of which the rods may be drawn so as to move the ends of arms 122 farther apart or permit them to move nearer together to adjust the tension of the strap. The hammer being suspended on the strap is cushioned in both directions.

In Figs. 16 and 17 the hammer 80 and its plunger 61 are suspended upon a pair of hinged rods 127 at their central point 128, said rods connecting the ends of a bow-spring 129, which passes through an opening in the casing, the hammer being thereby cushioned in both directions.

Many modifications might manifestly be made in the cushioning mechanism, and pneumatic cushioning devices might be utilized for the purpose.

My tamping-machine may be either portable or self-propelling by means of its own power, the construction described being probably better adapted to be driven by its own power, as in traction-engines, as I have illustrated in Figs. 9, 10, 11, 14, and 15 certain modifications whereby the mechanism is better adapted to use as simply a portable machine. In this construction the hammers, plungers, casings, and triangular swinging adjusting frames and springs are of the same construction as shown in Fig. 1 and are marked by the same numerals; but the frame of the machine and other parts are modified in construction, the frame comprising top and bottom longitudinal beams 130 and 131, front and rear uprights 132 and 133, and top and bottom end cross-beams 134 and 135, central longitudinal beams 136 and 137 being also provided, and the whole supported at the four corners on rollers 138. The horizontal arms 69 of the triangular frame carry grooved rollers 139 140, which engage and travel on the upper edges of longitudinal rails or guide-bars 141, while grooved rollers 142, carried by the vertical arms 70, and grooved rollers 143, carried by bars 144, depending from the horizontal arms 69, engage and travel on the lower edge of the rails. By this means the hammer-carrying mechanism may move longitudinally of the frame on the rails, being propelled by means of a drive-chain 145, mounted on sprocket-wheels 146, secured to short shaft 147, journaled in bearings 148 on the middle longitudinal beams 136 and 137 near the front end of the machine and sprocket-wheels 149 on a shaft 150, mounted in bearings 151 on the middle longitudinal beams near the rear end of the machine, the shaft being provided with a belt-pulley 152 to receive a belt from any suitable motor. (Not shown.) Pivoted links 153 154 connect the

traveling frames on each side of the machine with laterally-projecting pintles 155 156 of the drive-chains in such a manner as to permit of the continuous travel in one direction of the drive-chains without reversal, the frame being thereby carried back and forth on the rails. The rails extend some distance in front of the front sprocket-wheels of the drive-chains to allow the links to be carried around with the chains. On the horizontal arms 69 of the traveling frames are bearings in which the crank-shaft 43 is mounted, the hammers being operated by the cranks of this shaft and their pitmen, such cranks and pitmen operating the same way and being marked with the same numerals as in Figs. 1 to 6. The crank-shaft in this construction has a belt-pulley 157, connected by a belt 158 with a pulley 159 on a shaft 160, mounted in one end of a pair of arms 161, pivotally mounted at their opposite ends on the crank-shaft. The shaft 160 carries another pulley connected by a belt 162 with a pulley 163 on a shaft 165, mounted in bearings 166 on the top longitudinal beams and driven from the drive-shaft 150 through the medium of gear-wheels 167 and 168. Rigid links or bars 169 170 connect the shafts 160 and 165. By means of this arrangement of gearing and belts and pulleys the hammers will always be properly driven without regard to the position of the traveling frame on the guide-rails.

In the construction shown in Figs. 9, 10, and 11 the guide-rails are horizontal and the travel of the frame is necessarily on a level or horizontal plane when the machine is properly leveled for tamping level work. To adapt the machine to oval or upwardly-curved work, the straight rails may be removed and upwardly-curved rails 171 substituted, as shown in Fig. 14, or downwardly-curved rail 172, as shown in Fig. 15, may be substituted to adapt the machine to the tamping of gutters or concave work.

The machine may be leveled up when desired by any suitable leveling means—such, for instance, as a corner-screw 173 and hand-wheel 174, as shown in Fig. 14.

The provision of the movable hinged casing, in which the hammer-plunger is suspended, does away with the friction usual in trip-hammers, and this principle can be used to great advantage in trip-hammers, stone-drilling machinery, and in many other classes of machines, the force of the stroke being always under perfect control.

From the foregoing description, taken in connection with the drawings, the construction, operation, and advantages of my invention will be apparent, and while I have illustrated and described what I consider to be efficient means for carrying out my invention I do not wish to be understood as restricting myself to the exact forms and arrangements set forth, but hold that any slight changes and modifications thereof, such as would suggest themselves to the ordinary mechanic, would be clearly included within the limit and scope of my invention.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In a machine for tamping concrete, the combination of the frame, tamping-hammers, plungers to which they are attached, casings inclosing the plungers, means for reciprocating the casings and springs in the casings pressing in opposite directions for cushioning the stroke and return of the hammers, substantially as set forth.

2. In a machine for tamping concrete, the combination with the frame of a hollow casing pivotally supported thereon, a plunger therein having a central collar, a hammer carried by the plunger, springs around the plunger, and above and below the collar and means for reciprocating the casing, substantially as described.

3. In a machine for tamping concrete, the combination with a hammer, a plunger and a casing, of the pivoted frame from which the casing is supported, a shaft therein, a crank on the shaft, a link connecting the crank with the casing, and a spring counterbalance connecting the frame beyond its pivot with the casing, substantially as described.

4. In a machine for tamping concrete, the combination with a wheeled support, of a series of vertically-arranged, hammer-carriers thereon, and means for varying the angle of inclination of the carriers in all directions.

5. In a machine for tamping concrete, the combination, with a wheeled support, of a tilting frame thereon, a swinging frame suspended on the tilting frame at right angles to the axis of the movement thereof, and a series of hammer-carriers on the swinging frame.

6. In a machine for tamping concrete, the combination, with a wheeled support, of a tilting frame thereon, a swinging frame on the tilting frame, links on the swinging frame, and a series of hammer-carriers pivotally secured to said links.

7. In a machine for tamping concrete, the combination, with a wheeled support, of a frame thereon, a hammer-carrying frame pivotally mounted on the first-mentioned frame, pairs of links on said hammer-frame, a hammer-carrier pivotally secured to each pair of links, and a spring connected with the frame at one end and with the hammer-carrier at the other.

8. In a machine for tamping concrete, the combination, with a wheeled support, of a tilting frame mounted thereon, a triangular, frame suspended from the tilting frame, links secured to the vertical portion of the triangular frame, hammer-carriers pivotally secured to the said links, and a spring secured to the top of the frame beyond the hammer-carriers at one end and to the carriers, in line with the links, at the other end.

9. In a machine for tamping concrete, the combination, with a wheeled support, of a

tilting frame thereon, a triangular frame suspended from the tilting frame, at its upper end, hammer-carriers on the triangular frame, and means for raising the triangular frame vertically and for swinging it at right angles to the line of the axis of the movement of the tilting frame.

10. In a machine for tamping concrete, the combination, with a wheeled support, of a tilting frame thereon, a horizontally-arranged frame pivotally secured on the tilting frame, hammer-carriers suspended from the forward end of said frame, and means for moving the horizontal frame on its pivots and holding it in its adjusted position.

11. In a machine for tamping concrete, the combination, with a wheeled support, of a tilting frame thereon, a horizontally-arranged frame pivotally secured to the top thereof, a hammer-carrying frame suspended from the horizontal frame, and means for adjusting each of said frames independently of the others.

12. In a machine for tamping concrete, the combination, with a wheeled support, of a tilting frame thereon, a lever for adjusting it, a horizontally-arranged frame on the tilting frame, provided with a hand-lever and pawl, a rack in position to be engaged by the pawl, a hammer-carrying frame suspended from the horizontal frame, and a hand-lever connected with the hammer-carrying frame, provided with a pawl and a rack in position to be engaged by the pawl.

13. In a machine for tamping concrete, the combination, with a wheeled support, of a tilting frame thereon, a horizontally-arranged frame pivotally mounted thereon, a crank-shaft journaled on the forward end thereof, a frame suspended from the horizontal frame, a series of cylinders yieldingly supported by the horizontal frame, the upper end of which is connected with the crank-shaft and a hammer projecting from the lower end.

14. In a machine for tamping concrete, the combination, with a wheeled support, of a tilting turn-table mounted thereon, a lever pivotally secured to the turn-table, one end of which is provided with means for holding it in its adjusted position, a bar connected with the other end of the lever and with the support, and a series of hammers carried by the turn-table.

15. In a machine for tamping concrete, the combination, with a wheeled support provided with a track, of a turn-table on the support provided with rollers for engaging with the track, a lever on the turn-table one end of which is provided with means for holding it in its adjusted position, a bar at the other end of the lever, the lower end of which engages with the track and hammers carried by the turn-table.

16. In a machine for tamping concrete, the combination, with a base, the center of which is provided with a casting, of a turn-table on the base provided with a depending casting and with two fulcrum-blocks, a bolt through the castings, means for tilting the turn-table laterally on said blocks, and a series of adjustable hammer-carriers on the turn-table.

17. In a machine for tamping concrete, the combination, with a base, of a frame supported thereby, and a series of yieldingly-supported casings on the frame, and a cushioned hammer in each casing.

18. In a machine for tamping concrete, the combination, with a base, of a tilting frame thereon, a series of yieldingly-supported casings on the frame, a cushioned hammer in each casing, and means for adjusting the positions of the frame and the hammers.

19. In a machine for tamping concrete, the combination with the stationary frame, of a frame pivoted thereto at one end, hammer mechanism carried thereby, near its opposite end, a counterbalancing-spring beyond the hammer-pivot, connecting the hammer mechanism with the pivoted frame, a curved rack secured to the stationary frame, and the hand-lever and pawl carried by the pivoted frame at its inner end, substantially as described.

20. In a machine for tamping concrete, the combination of stationary frame, a swinging frame thereon, hammer mechanism carried by the swinging frame, a hand-lever, pawl and curved rack carried by the stationary frame, and a link-bar connecting the swinging frame with the hand-lever, substantially as described.

21. In a machine for tamping concrete, the combination with a stationary base, of a frame carrying the hammer mechanism mounted to tilt thereon, and means for adjusting the inclination of the hammer-frame laterally with relation to the base to cause the direction of the hammer-strokes to incline laterally, substantially as described.

22. In a machine for tamping concrete, the combination of a base-frame, a turn-table mounted thereon on oppositely-located fulcrum-blocks and carrying the operative mechanism, a hand-lever, pawl and rack carried by the turn-table, and a link-bar connecting the hand-lever with the base, substantially as described.

23. In a machine for tamping concrete, the combination of a pivoted frame, swinging triangular frames pivoted at their angles to the pivoted frame, a crank-shaft on the pivoted frame, a hammer-plunger casing, a pitman connecting it to the crank-shaft, and parallel links connecting the swinging frame with the casing, substantially as described.

24. In a machine for tamping concrete, the combination of a stationary frame, a horizontally-disposed frame pivoted thereto, a crank-shaft on the pivoted frame, a hammer-plunging casing, a pitman connecting it with a crank on a crank-shaft, triangular swinging frames pivoted to the pivoted frame, parallel links connecting the vertical arms of the triangular frame with the casing, springs connecting the forward ends of their horizontal

arms to the casing, and adjustable connections between the triangular frames and the stationary frame, substantially as described.

25. In a machine for tamping concrete, the combination with a wheel-supported frame, of a hammer-carrying frame thereon, and means for moving the hammer-carrying frame forward and back in the line of movement of the wheeled frame and independently of the movement of the latter, substantially as described.

26. In a machine for tamping concrete, the combination, with a wheel-supported frame, of a hammer-carrying frame pivotally supported thereon and movable forward and back at the sides of the wheeled frame in the line of movement of the latter and independent of the movement thereof, substantially as described.

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