

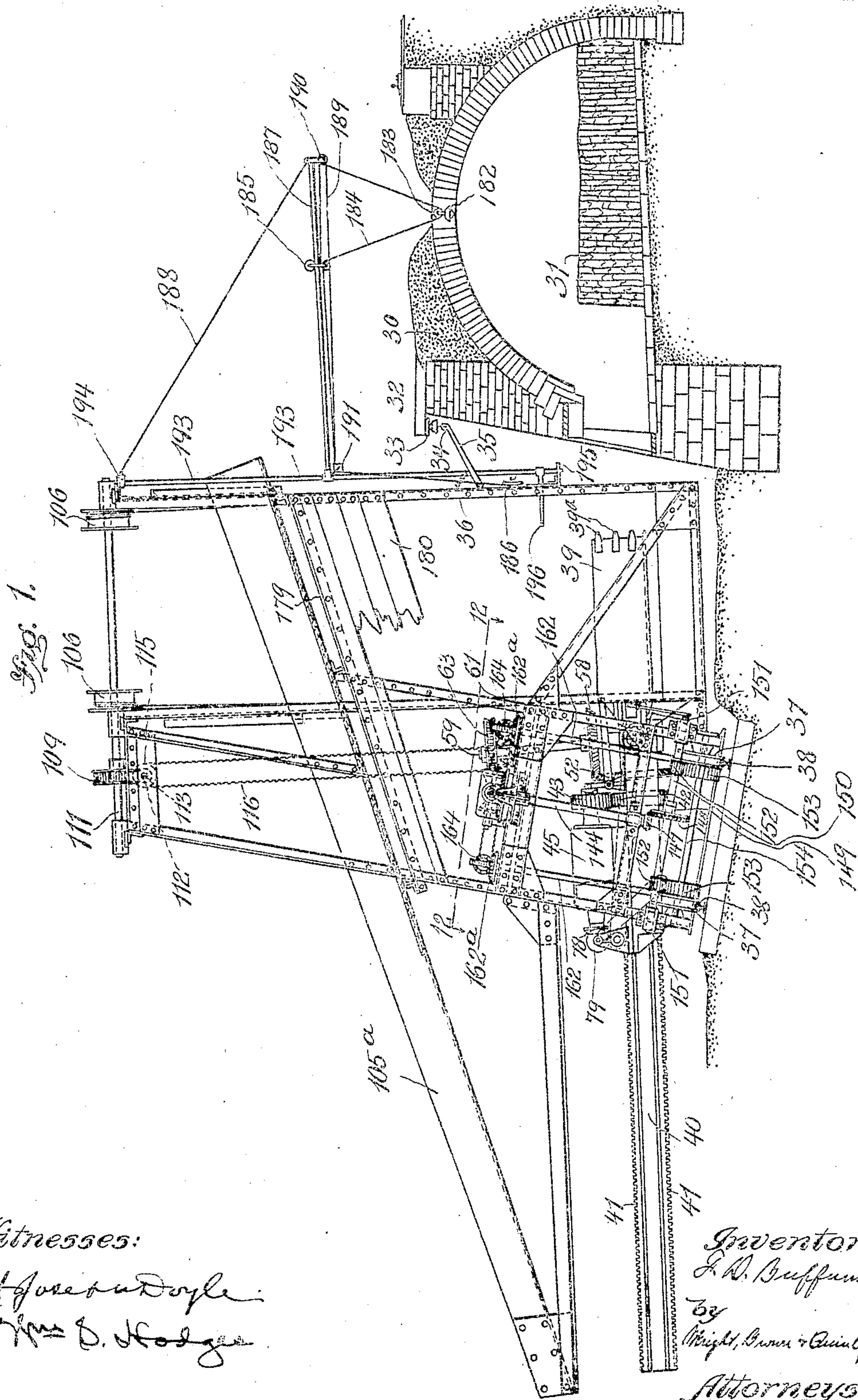
No. 786,623.

PATENTED APR. 4, 1905.

F. D. BUFFUM.
MACHINE FOR DRAWING COKE.

APPLICATION FILED APR. 26, 1904.

7 SHEETS—SHEET 1.



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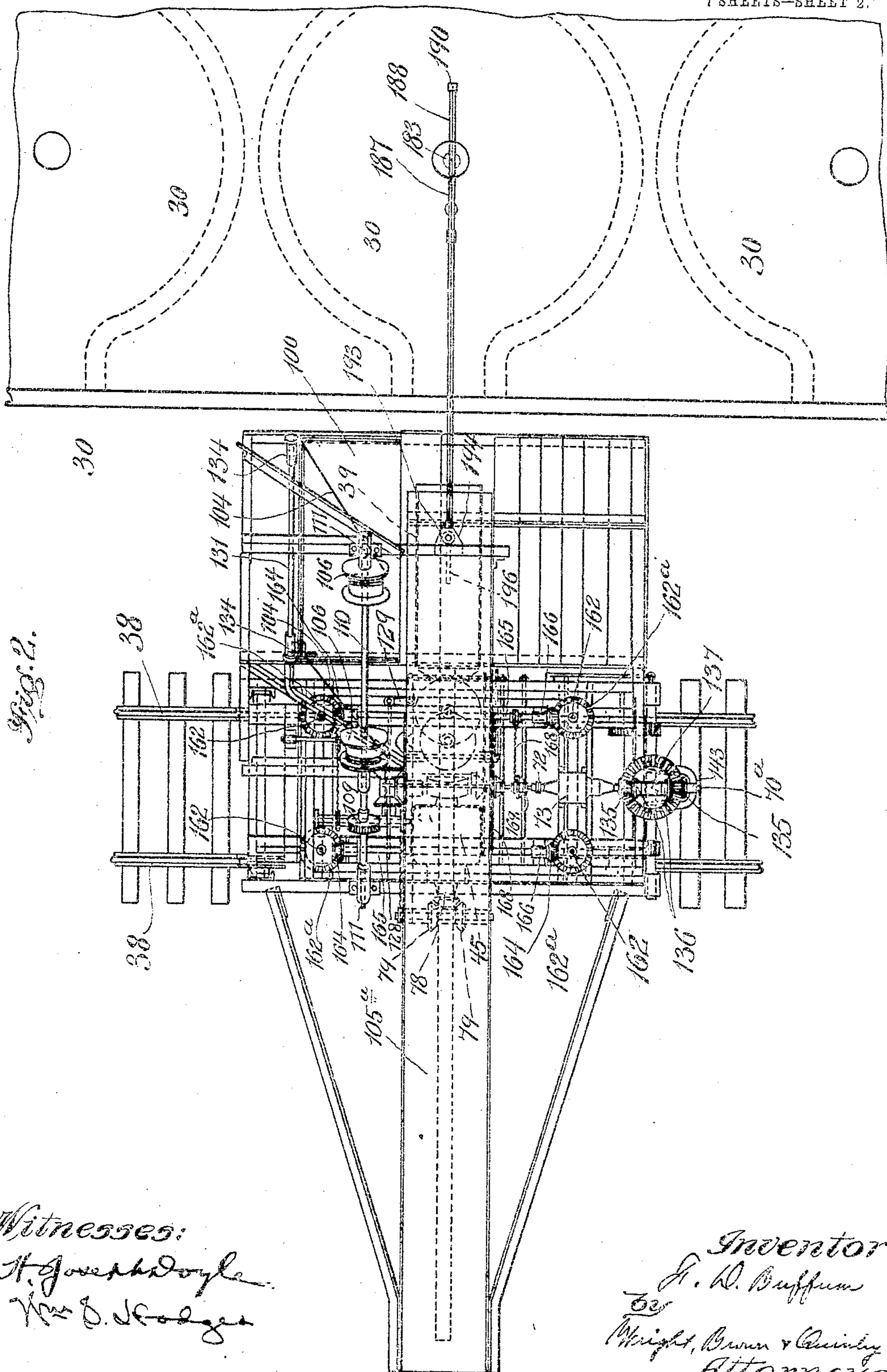
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7 SHEETS—SHEET 2.



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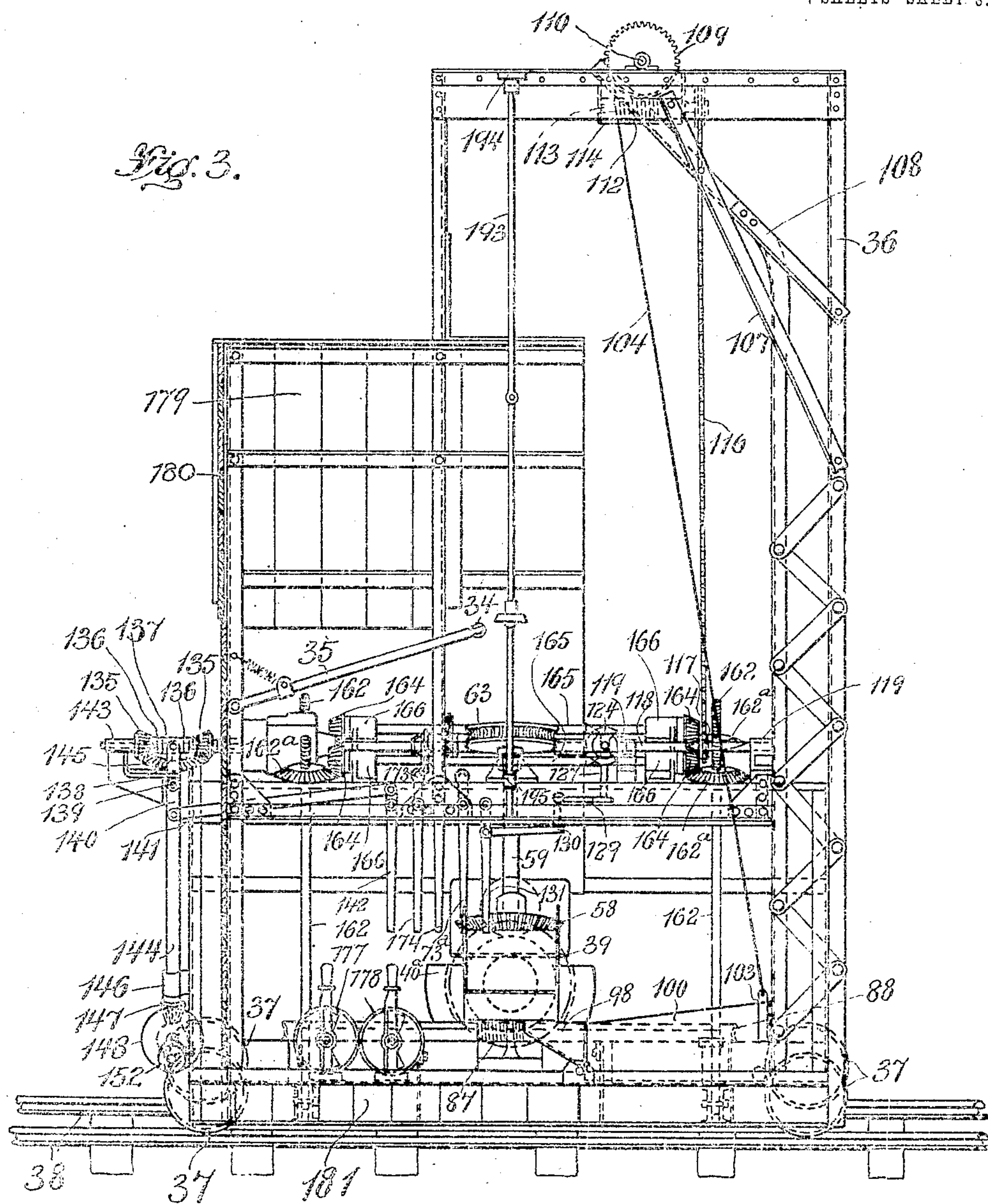
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7 SHEETS—SHEET 3.



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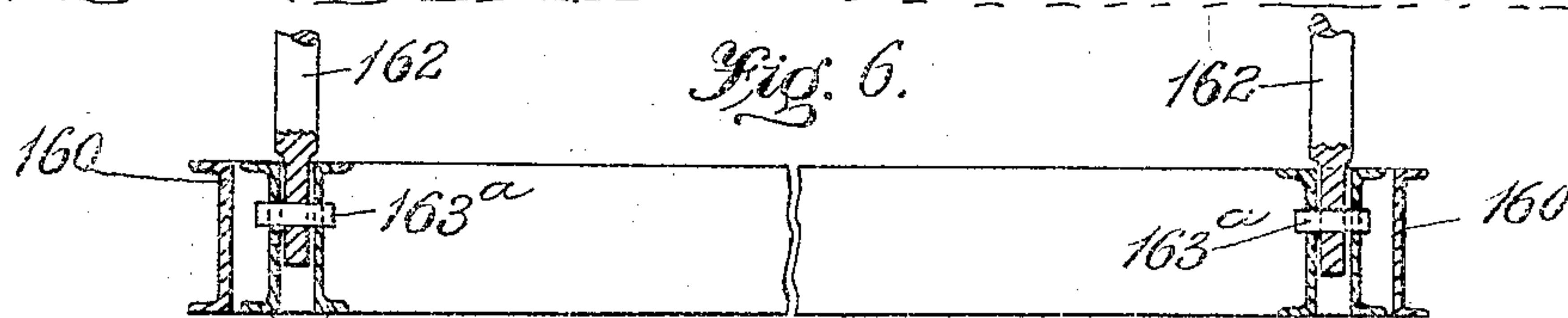
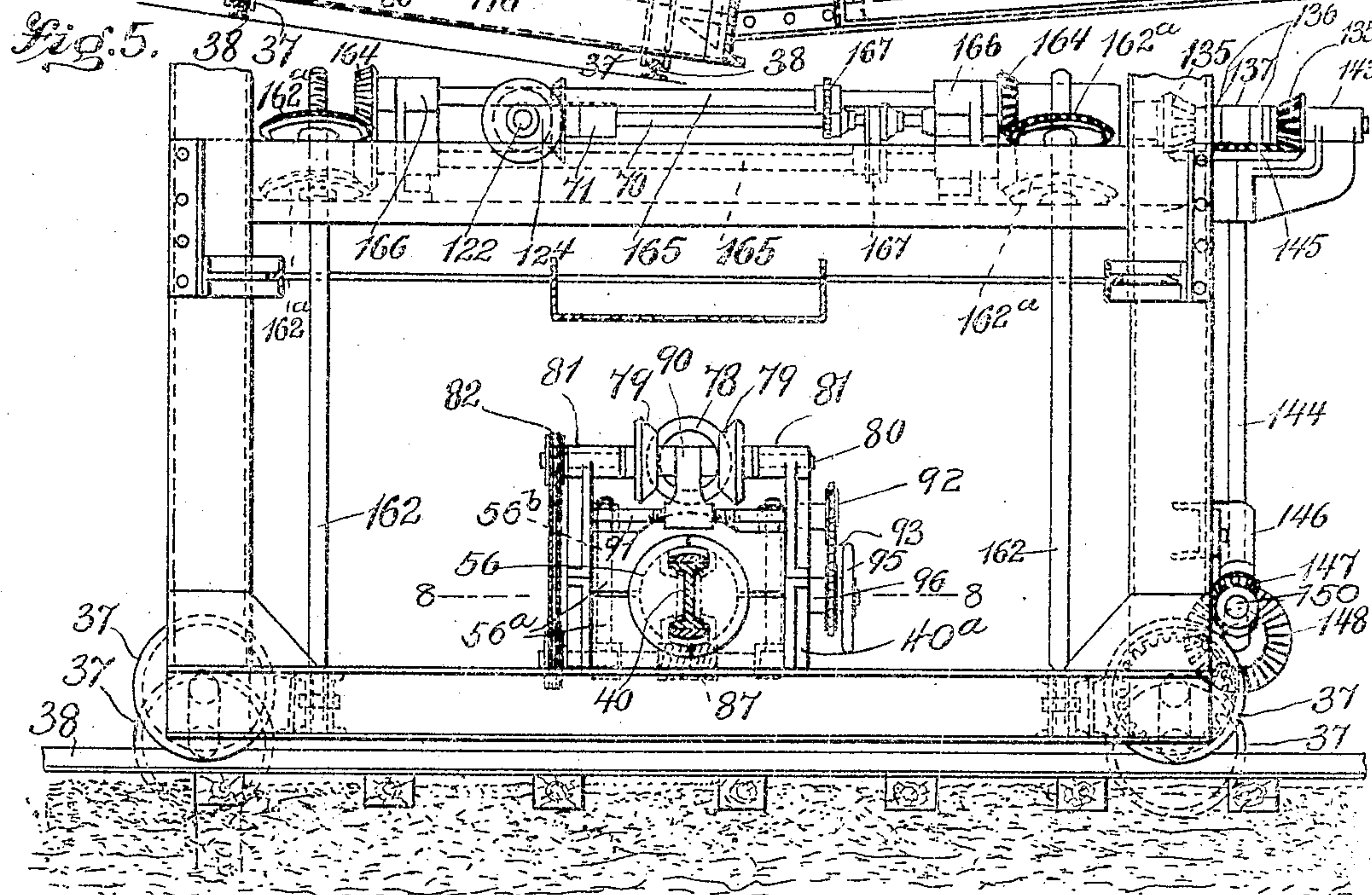
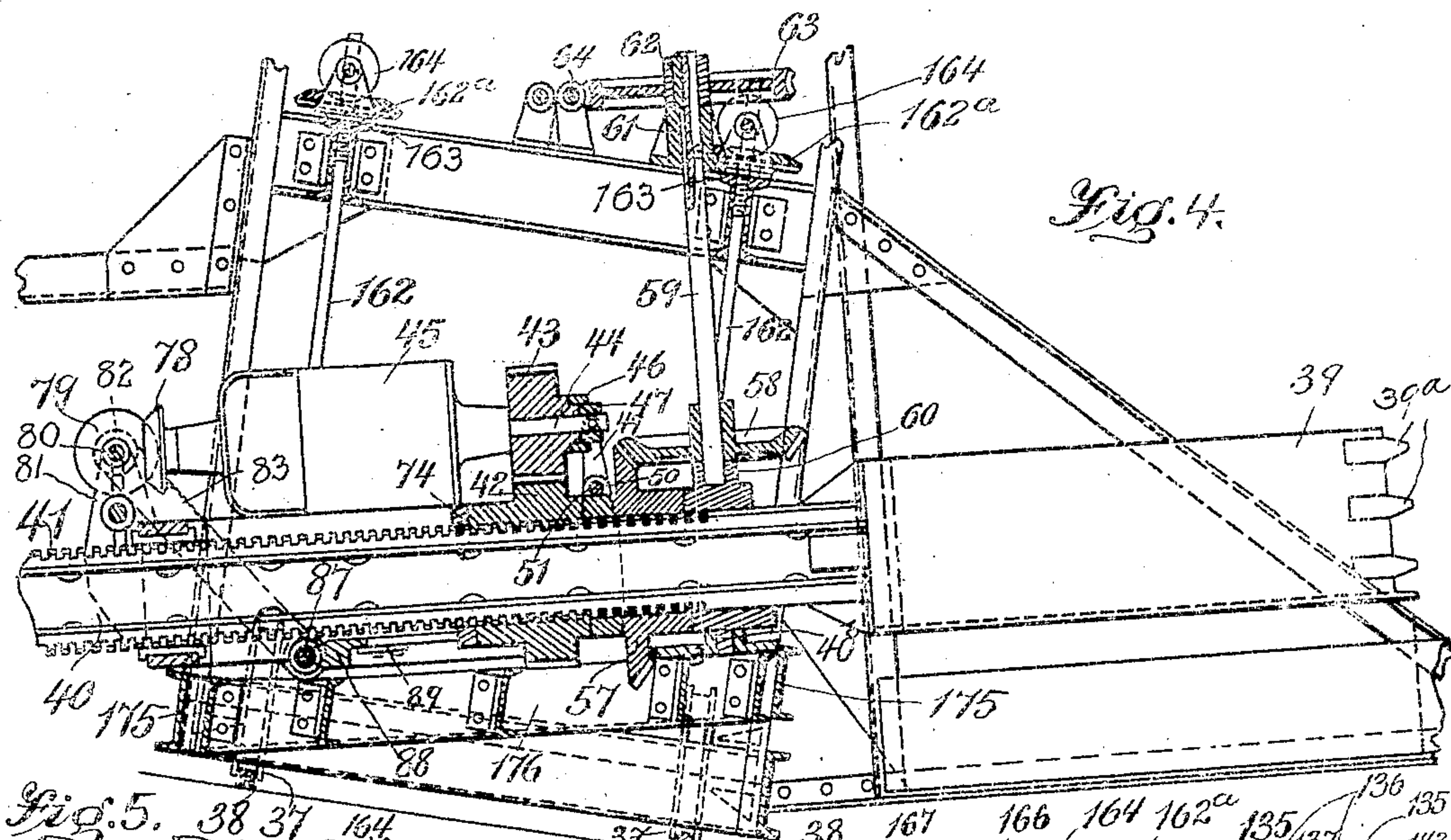
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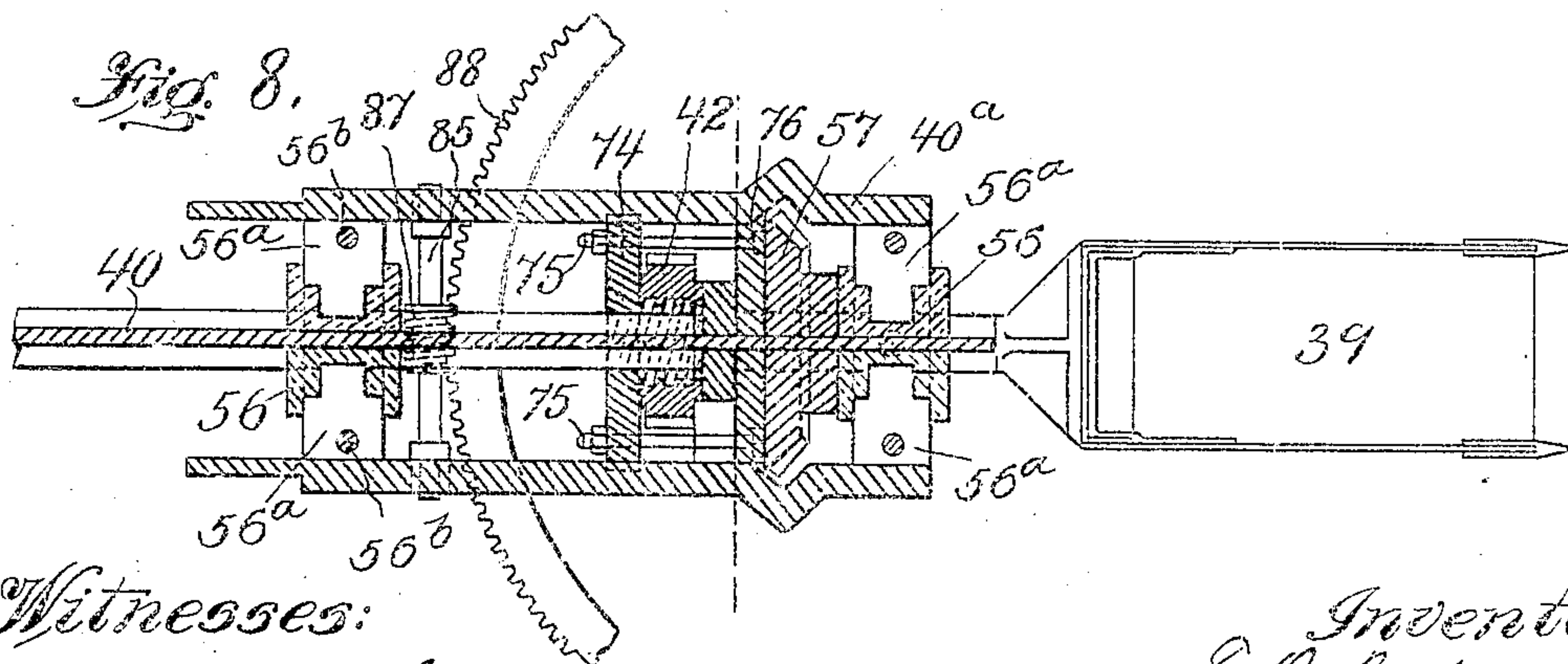
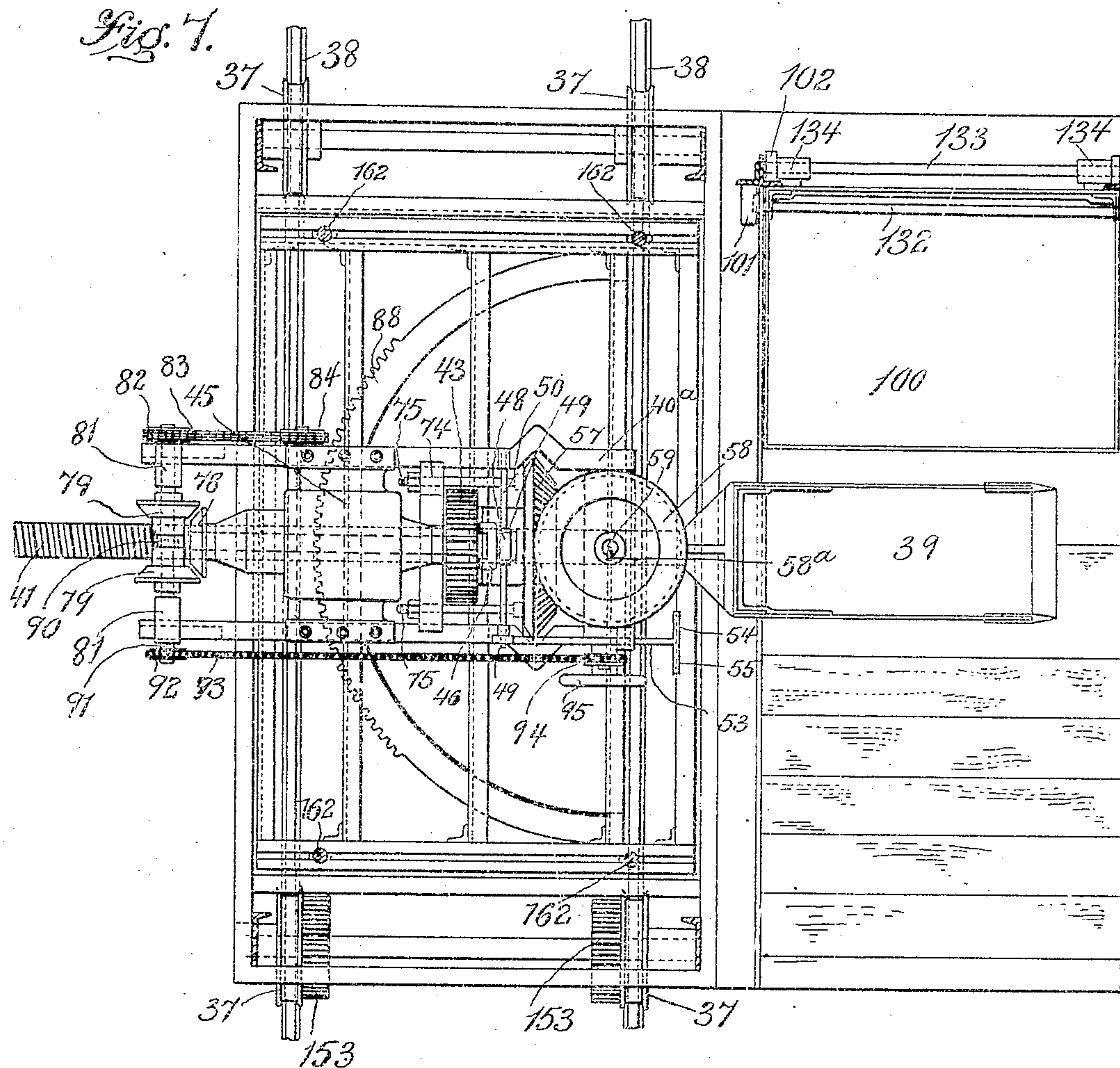
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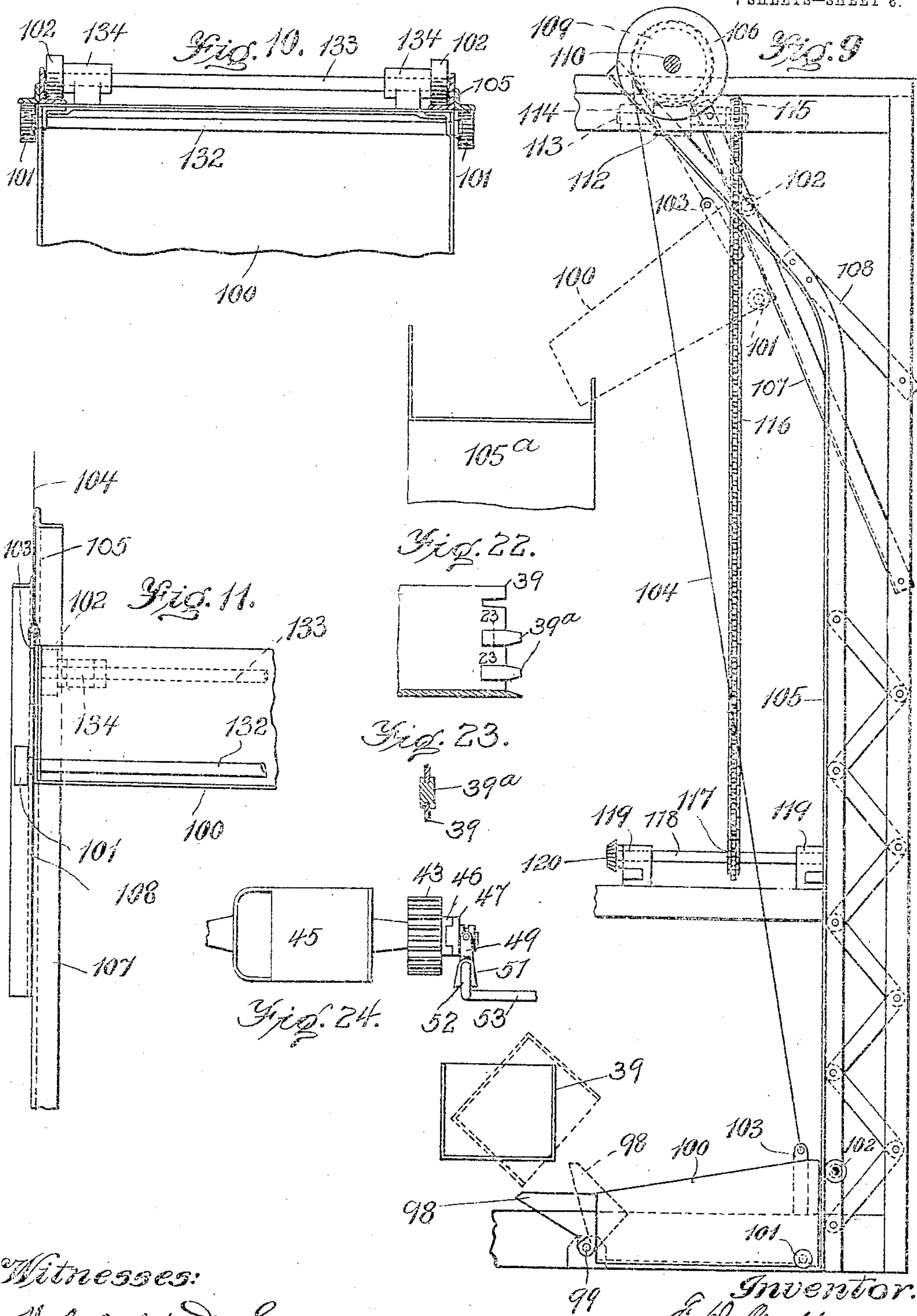
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7 SHEETS—SHEET 8.



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APPLICATION FILED APR. 26, 1904.

7 SHEETS—SHEET 7.

Fig. 12.

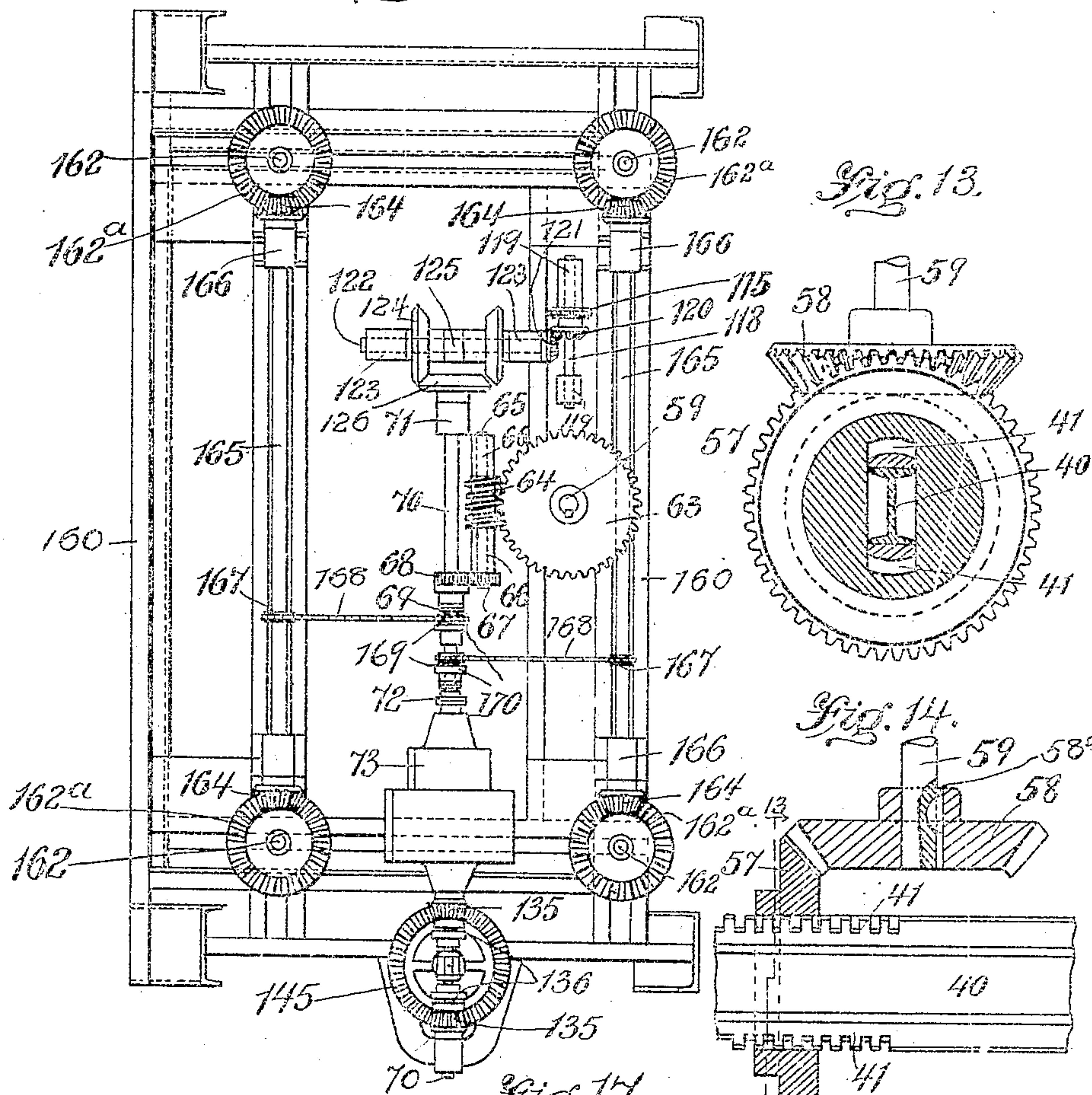


Fig. 13.

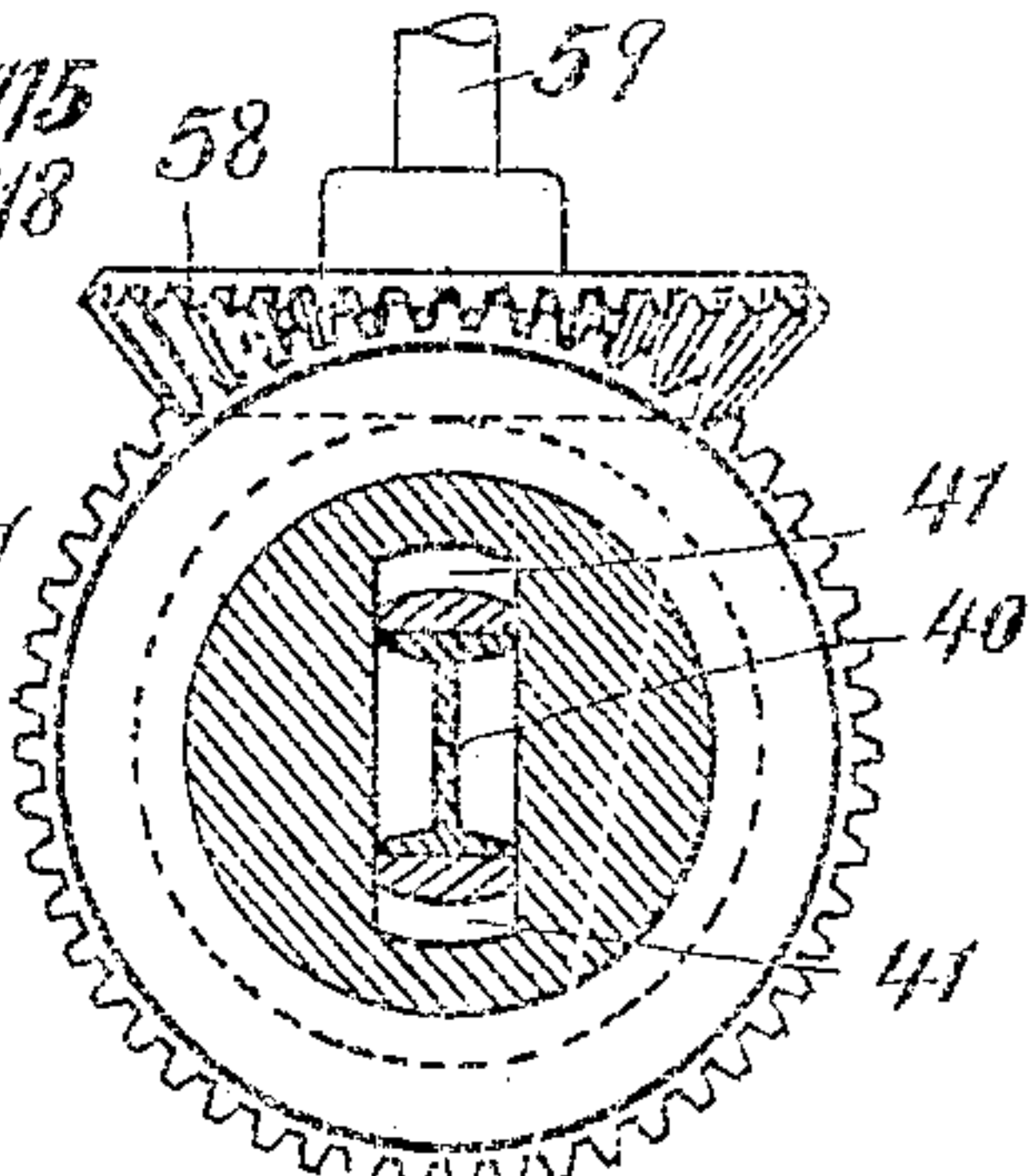


Fig. 14.

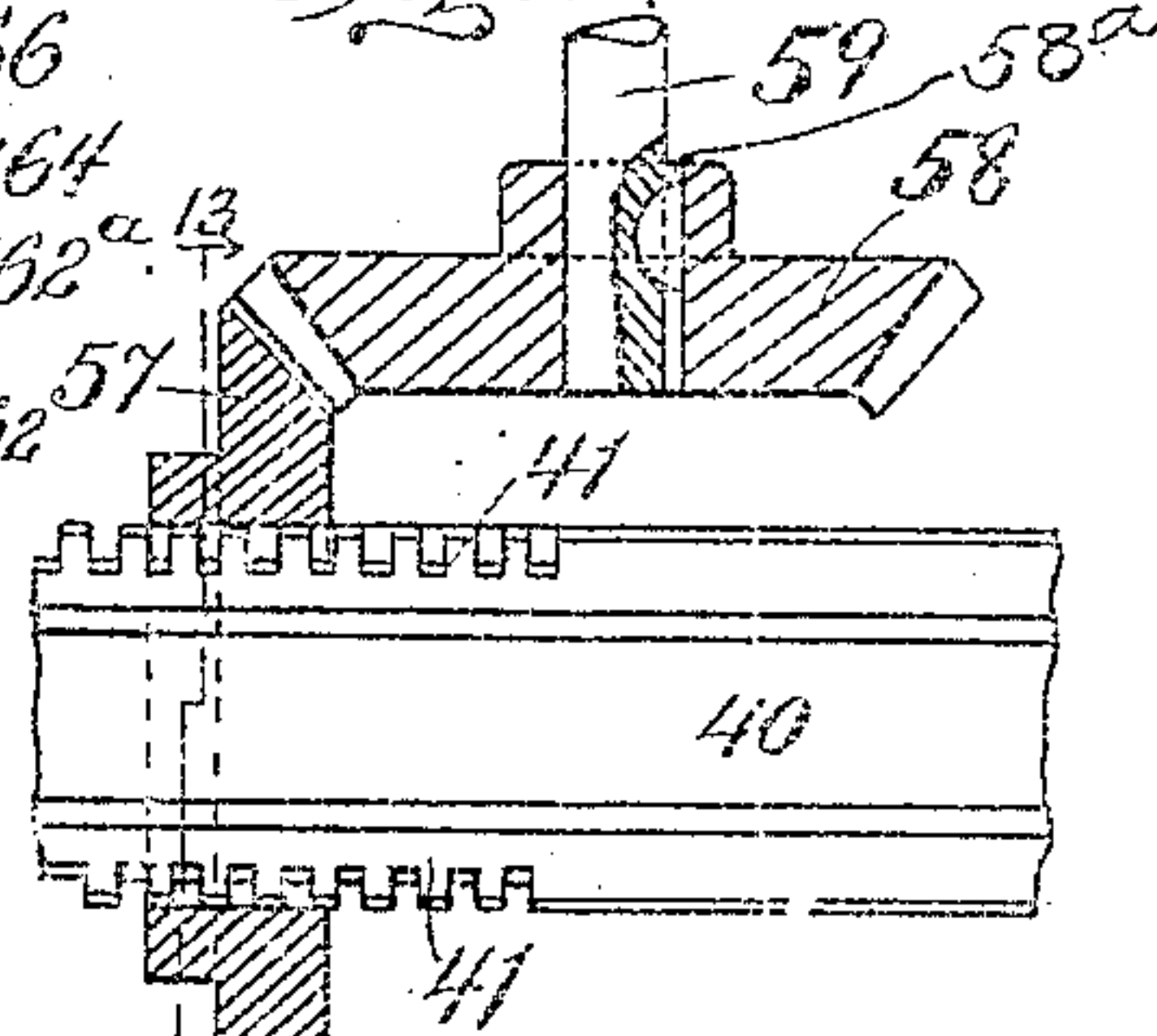


Fig. 15.

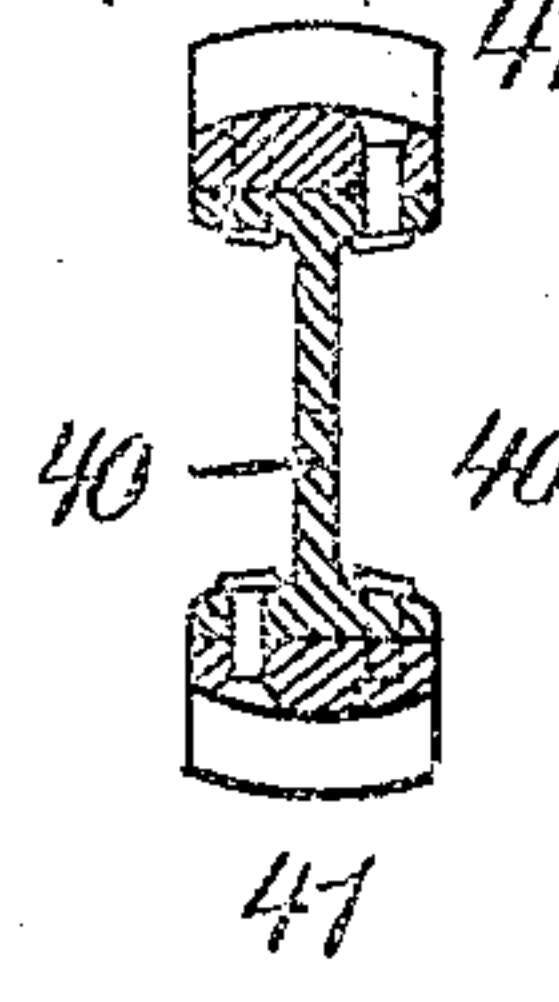


Fig. 16.

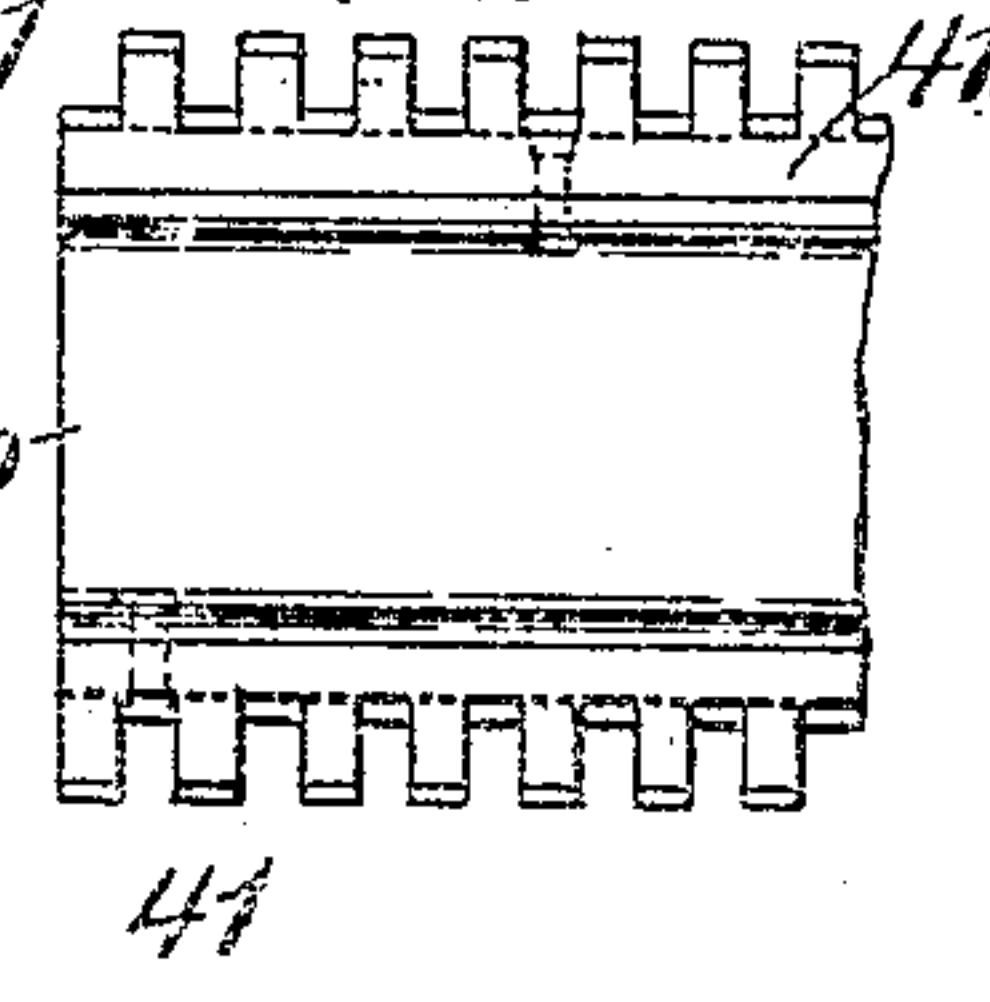


Fig. 17.



Fig. 18.

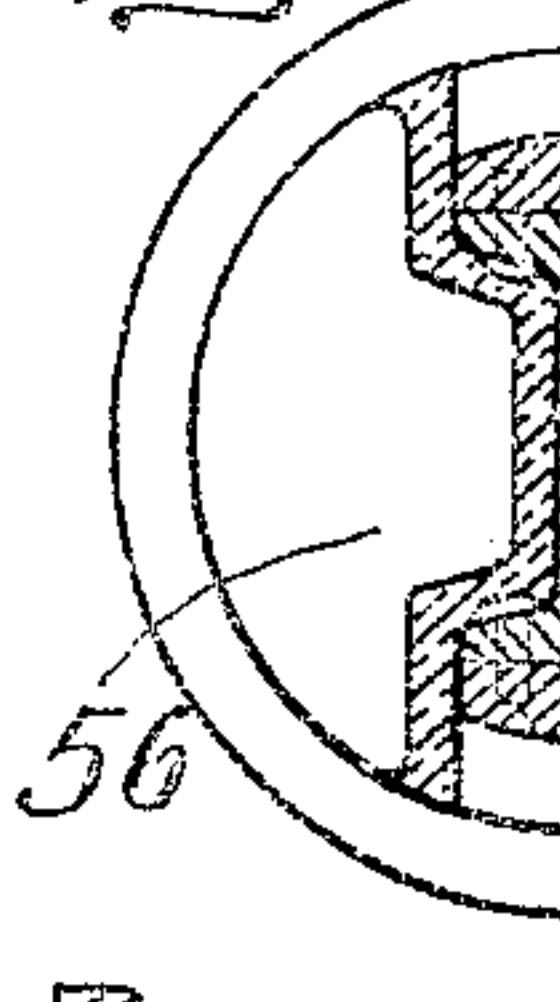


Fig. 19.

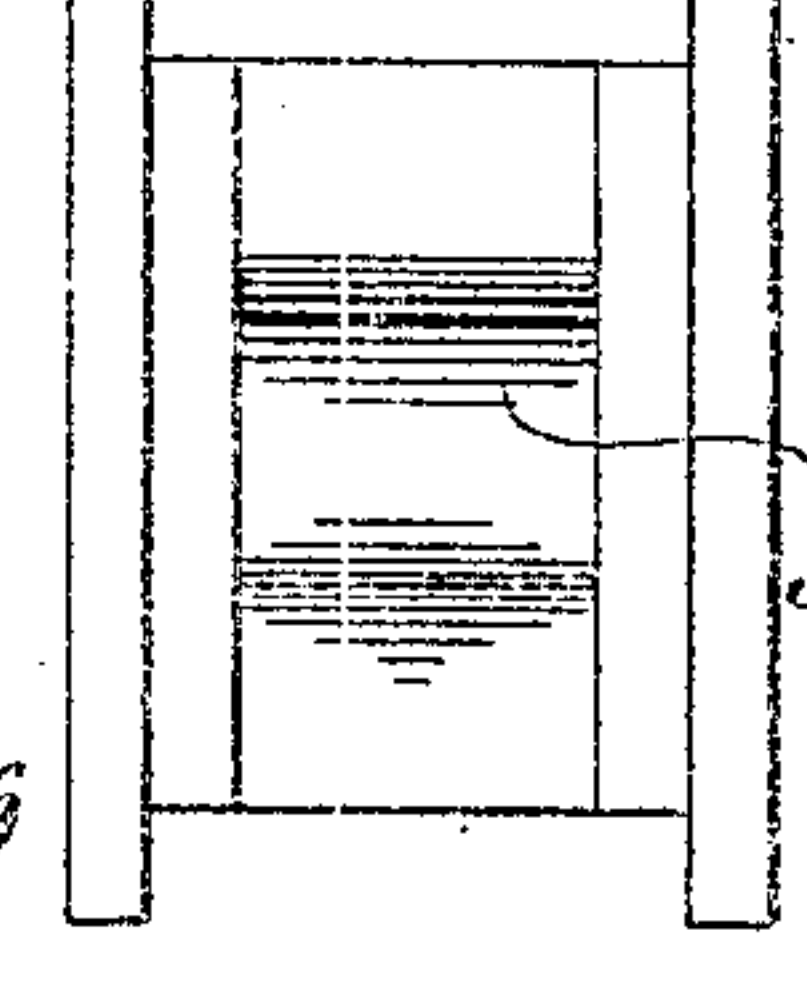


Fig. 20.

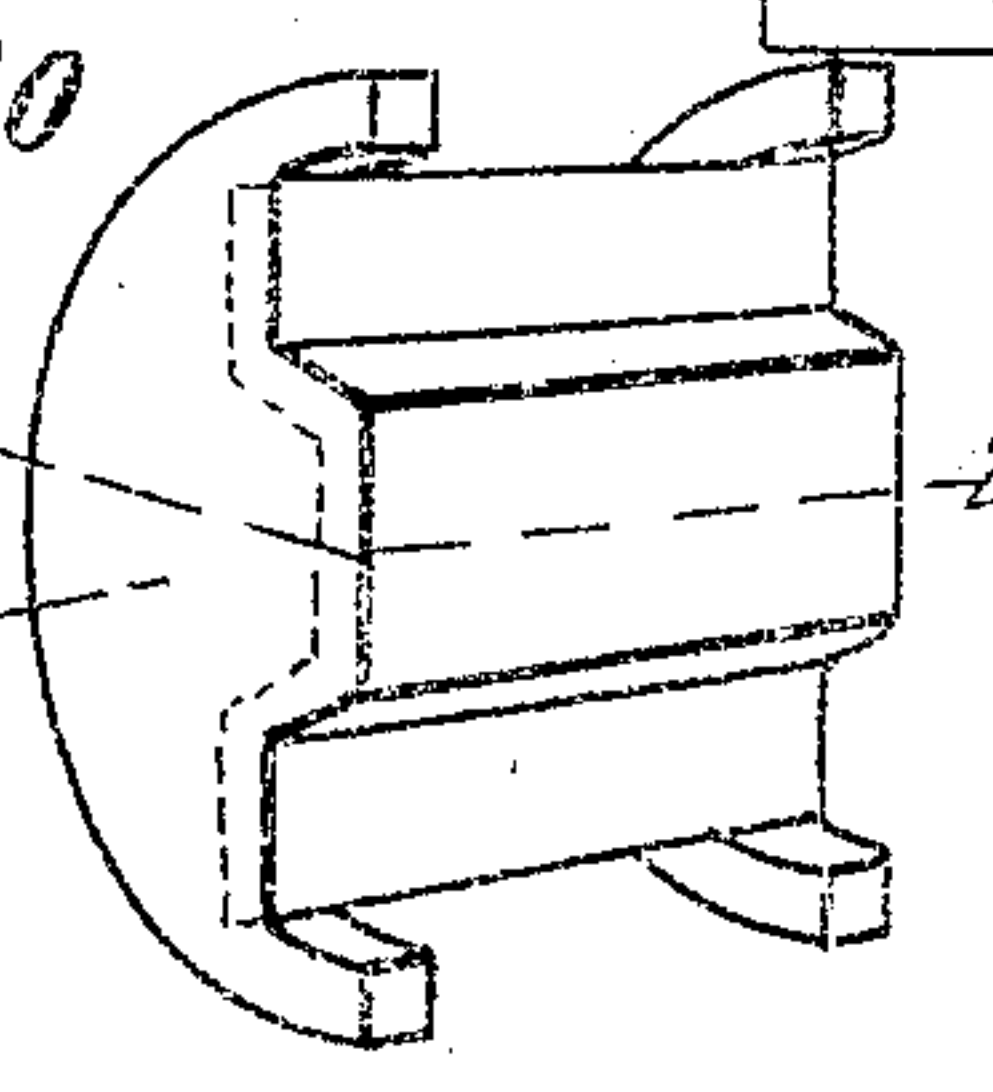
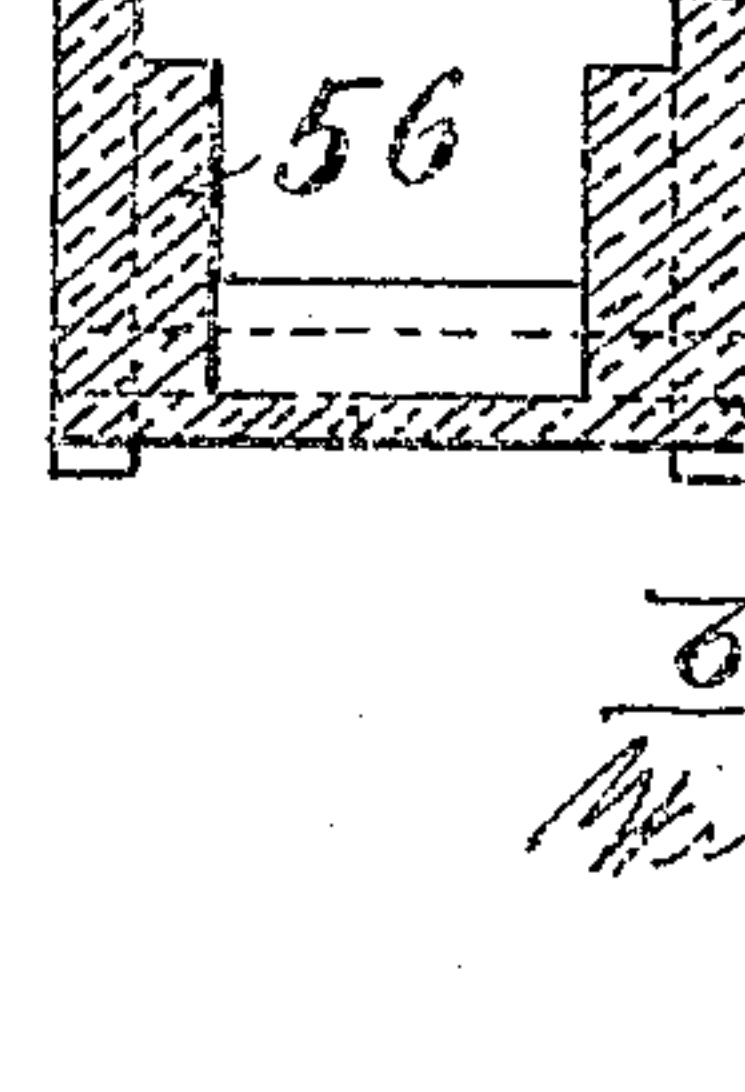


Fig. 21.



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UNITED STATES PATENT OFFICE.

FREDERICK D. BUFFUM, OF NEWTON, MASSACHUSETTS.

MACHINE FOR DRAWING COKE.

SPECIFICATION forming part of Letters Patent No. 786,623, dated April 4, 1905.

Application filed April 26, 1904. Serial No. 204,957.

To all whom it may concern:

Be it known that I, FREDERICK D. BUFFUM, of Newton, in the county of Middlesex and State of Massachusetts, have invented certain
5 new and useful Improvements in Machines for Drawing Coke, of which the following is a specification.

This invention relates to mechanism for drawing coke from coke-ovens; and the object
10 of the invention is to provide an apparatus of this character by means of which the coke in the oven of a well-known type may be removed by means of a shovel which can be run into the solid mass of coke in the oven, then
15 withdrawn full of coke, and then dumped by a partial or complete rotary motion into a skip or basket which may be hoisted to dump the coke into a chute, from which the coke may slide by gravity to a suitable point for
20 loading into cars.

Some of the particular objects of the invention are to provide means for lighting the ovens during the removal of the coke; providing a shovel with removable teeth which can
25 be taken off for sharpening or renewal; providing a shovel which may be swung so as to act upon the coke practically at any point upon the floor of the oven; the provision of means, such as bushings, for keeping the shovel
30 straight during its operations; the provision of means for taking up the thrust of the gear which drives the shovel; the provision of means for raising or lowering the shovel relative to the floor of the oven and for changing
35 the vertical angle at which the shovel is projected; the provision of an inclined track or support for the machine to resist thrust of the shovel; the provision of improved means for driving the machine along the track; the provision of means for elevating the coke after
40 its removal from the oven and transferring it to a coke-yard by means of a gravity-chute; the provision of a cab for protecting the operator of the machine; the provision of improved means for supporting the trolley-wire which supplies the electric current for operating the machine.

Other minor objects of the invention will become apparent in connection with the detailed description hereinafter.

To these ends the invention consists in the construction and combination of parts substantially as hereinafter described and claimed.

Of the accompanying drawings, Figure 1 represents what may be best termed an "end
55 elevation" of the machine, since the view is looking in the direction of the path which the machine takes in traveling from one coke-oven to another. Said figure illustrates also an oven of a series in vertical section. Fig. 2
60 represents a plan view of the machine, portions of a series of coke-ovens being represented in dotted lines. Fig. 3 represents a front elevation of the machine looking from the right of Figs. 1 and 2. Fig. 4 represents, on
65 a somewhat larger scale than Figs. 1 and 2, a detail vertical section through substantially the center of the machine. Fig. 5 is an elevation looking from the left of Fig. 4 with the shovel-handle and a portion of the frame in section.
70 Fig. 6 is a detail view, partly in section, of a portion of the stationary carriage-frame. Fig. 7 is a plan view of the portions of the apparatus shown in Fig. 4. Fig. 8 is a detail view, partly in section, on line 8 8 of Fig. 5
75 of a portion of the shovel-manipulating mechanism. Fig. 9 is a detail view, on a slightly larger scale than Fig. 3, of portions of the apparatus for hoisting the coke-bucket to discharge the coke into the final delivering-chute.
80 Fig. 10 is a detail view of a portion of the hoisting-bucket and a sectional view of the guides of the tower. Fig. 11 is a detail view of a portion of the apparatus shown in Fig. 9 and looking from the left of said Fig. 9. Fig.
85 12 represents a detail section on the line 12 12 of Fig. 1, but on a larger scale. Fig. 13 is a section on the line 13 13 of Fig. 14. Fig. 14 represents a detail side elevation of a portion of the shovel-handle, showing the gears for
90 turning the shovel, in section. Figs. 15 and 16 are respectively a section and a side elevation of the shovel-handle. Fig. 17 is a sectional view of the internally-threaded gear which is driven by the motor to advance and
95 retract the shovel. Fig. 18 represents the two bushings for the shovel-handle, the latter being shown in section. Fig. 19 is a side elevation of one of the bushings looking from the outer side thereof. Fig. 20 is a perspec-
100

tive view of one of the bushings. Fig. 21 represents a section on line 21 21 of Fig. 20. Fig. 22 is a detail, partly in section, of the front of the shovel with one tooth omitted. 5 Fig. 23 represents a section on line 23 23 of Fig. 22. Fig. 24 is a detail elevation of one of the motors and an adjacent clutch-operating mechanism.

Similar reference characters indicate similar parts throughout the several views.

In Figs. 1 and 2, 30 represents the coke oven or ovens of a common type, which are usually arranged in a long row or series. The mass of coke in one of the ovens is represented at 31. Projecting over the front wall of the ovens are supports 32 for a plank 33, below which is the wire 34, connected to a suitable source of electricity. 35 represents a trolley-arm projecting from the frame 36 of the machine, said frame being supported by wheels 37, running upon rails 38, which extend along the row of ovens. The wire 34 is preferably hung from insulators supported at intervals from the under side of the plank. This provision of the plank 33, with the wire 34 beneath it, serves to protect the workmen from coming in contact with the wire when they have occasion to climb to the top of the oven. Usually when such climbing is required a ladder is employed, which ladder may rest against the edge of the plank instead of against the usual top edge of the front wall of the row of ovens. This arrangement is such that wherever the machine is along the line of ovens the current for operating the machine is obtainable from the wire 34.

By reference to Figs. 1, 3, and 4, it will be seen that the trackway for the machine is so laid that the rail 38 nearest to the row of 40 ovens is lower than the other rail. This is in order to better balance the machine and to enable it to resist the back thrust due to the forcing of the shovel into the mass of coke. 39 represents the shovel provided with teeth 45 39^a, adapted to be driven into the coke to break it up. Said teeth are preferably removable from the body of the shovel to enable said teeth to be readily taken off for re-sharpening or to enable broken ones to be replaced by new ones. These teeth may be connected with the body of the shovel in any preferred manner. For instance, the sides of the shovel 39 at the front edge are formed with tapered recesses, and the side edges of the 50 teeth 39^a are formed with grooves the bottom of which may be slightly inclined, so that the teeth may be driven into the tapered recesses of the shovel and wedged there. In Fig. 22 the front edge of the bottom of the shovel is shown as beveled and without teeth; but obviously this edge as well as the side edges may be provided with the removable teeth. The shovel 39 is rigidly connected to the forward end of the handle 40, said handle 40 extending through a guide 40^a. (See Figs. 3, 7, 8,

and 13.) The edges of the handle 40 are provided with teeth 40. As shown in Figs. 15 and 16, said handle comprises an I-beam, having toothed strips bolted to the surfaces of the flanged portions of said beam. The teeth 41 70 of the shovel-handle are engaged by the threads of an internally-threaded gear 42, said gear being driven by a pinion 43 on the shaft 44 of the motor 45. (See Figs. 1, 4, 7, and 8.) The shovel is advanced and retracted by the 75 rotation of the gear 42. The hub of the pinion 43 is formed with a clutch 46, adapted to be engaged by a mating clutch 47, splined on the shaft 44. The clutch-operating ring 48 (see particularly Fig. 7) is actuated by a lever 49, 80 carried by a shaft 50, mounted in journals 51. Projecting from the shaft 50 is a lever-arm 52 (see Figs. 1 and 24), said arm 52 having a rod 53 connected thereto. The outer end of the rod 53 is formed with a lateral extension 85 or stop 54, (see Fig. 7,) which is adapted to be struck by the rear portion of the shovel 39 when the latter is withdrawn in order to automatically cause the disengagement of the clutch in case the operator has failed to perform this act. A second lateral extension 55 90 of the said rod 53 forms a handle by means of which the operator may throw out the motor-clutch. In order to guide the shovel-handle, I provide bushings 56 56, (see Figs. 18 95 to 21, inclusive,) there being a pair of these bushings at each end of the guide 40^a. (See Fig. 8.) As shown in Fig. 5, each pair of the bushings 56 is mounted in a circular orifice formed in and by two blocks 56^a, which are 100 secured together and to the bottom of the guide 40^a by suitable bolts 56^b. As shown in Fig. 8, the bushings 56 are formed with flanges resting against the inner and outer 105 faces of the blocks 56^a to prevent movement of said bushings in the direction of the reciprocations of the shovel.

Referring to Figs. 13 and 14, 57 represents a bevel-gear having an opening through it which will enable the shovel-handle and its 110 toothed edge strips to pass back and forth through it. In other words, the opening in the bevel-gear closely fits the sides of the shovel-handle, so that any partial or entire rotation of the bevel-gear 57 will cause the 115 tilting or rotation of the shovel-handle and the shovel. This gear 57 (see Fig. 4) is so held between other portions of the mechanism hereinbefore and hereinafter described as to prevent any movement of the said gear 120 in a direction other than oscillatory or rotary. The said bevel-gear 57 is driven by a bevel-pinion 58, secured by a key 58^a to the shaft 59, the latter having a step-bearing 60, (see Fig. 4,) formed in a portion of the guide 40^a. 125 The guide 40^a has a stud 40^b fitted to a substantially vertical bearing in a portion 175 of the carriage-frame. The stud 40^b is in alignment with the shaft 59 and forms the center of motion about which the guide 40^a and the 130

shovel swing in order to vary the angle at which the shovel will operate in an oven in a manner and by mechanism hereinafter described. It will be readily understood that rotation of the shaft 59 will, through the pinion and gear 58 and 57, cause the shovel-handle and shovel to oscillate or rotate.

As shown by comparing Figs. 3, 4, 7, 8, and 9, the shovel 39 is angular in cross-section, the bottom of the shovel being flat and the sides being at an angle to said bottom. The front or operating edge of the shovel is straight, so that it can be moved along the bottom of an oven and work under the coke to lift it, the angular sides of the shovel serving to retain the coke on the bottom of the shovel. Moreover, owing to the operating edge of the shovel (whether teeth are employed or not) being substantially straight, the coke may be pried or broken away from the floor of the oven by the turning or oscillating movement imparted to the shovel. In other words, the front or operating bottom edge of the shovel is straight or flat in contradistinction to a curved shape in cross-section. As will be understood, the oscillation or turning movement imparted to a shovel curved in cross-section or at the front edge thereof cannot be utilized to dislodge coke so as to force or pry it upward from the bottom of the oven.

An upper bearing for the shaft 59 is shown at 61, said bearing being supported upon a suitable portion of the carriage-frame. Above said bearing 61 is a worm-wheel 63, secured to the shaft 59 by means of a key 62. Said worm-wheel is engaged by a worm 64, (see Figs. 4 and 12,) the shaft 65 of which is mounted in bearings 66 66. One end of the shaft 65 is provided with a spur-pinion 67, the teeth of which are engaged by the teeth of a spur-gear 68, the hub of which is formed with a clutch member 69. The gear 68 is carried by the shaft 70, mounted at one end in a bearing 71. The other end of the shaft 70 is connected by the flange-coupling 72 with the shaft of a motor 73. It will now be understood that the motor 73 is employed for rotating the shaft 59, so as to effect partial or complete rotation of the shovel. Power is obtained from the same motor 73, however, for other purposes, as will be hereinafter described, one of which is to elevate a vertically-adjustable portion of the carriage-frame, so as to bring the shovel into proper position vertically to operate in the oven by mechanism hereinafter described.

Referring to Figs. 4, 7, and 8, 74 indicates a thrust-plate against which the internally-threaded gear 42 abuts. Bolts 75 75 connect the thrust-plate 74 with the cross-piece 76 of the guide 40^a.

Referring to Figs. 1, 2, 4, and 7, 78 indicates a bevel friction-gear on the shaft of the motor 45. Said gear is adapted to be engaged

by either one of two bevel friction-gears 79 79, splined upon a shaft 80, which is mounted in bearings 81 81, bolted to the rear end of the guide 40^a. Upon one end of the shaft 80 is secured a sprocket 82, (see Figs. 4 and 7,) connected by a chain 83 with a sprocket 84 upon a shaft 85, mounted in suitable bearings and having a worm 87. (See Figs. 3, 4, 5, and 8.) Said worm meshes with a worm-wheel segment 88, secured to the under side of the guide 40^a by means of cleats 89. (See Fig. 4.) These cleats serve to prevent the guide 40^a from being tipped up at the rear when the shovel is advanced and loaded with coke should the weight of the said guide and the parts carried thereby be not sufficient to prevent such tipping. Through the mechanism just described the guide 40^a and the parts carried thereby, including the shovel, are swung or adjusted about the centering-stud 40^b to vary the angle at which the shovel will enter and operate in an oven. The sleeve carrying the friction-gears 79 is shifted by means of an arm 90, (see Figs. 5 and 7,) said arm being mounted upon a screw 91, journaled in the brackets which support the bearings 81. By rotating the screw 91 the sleeve 90 may be shifted to cause either one of the friction-bevels 79 79 to engage the friction-bevel 78. The screw 91 is provided at one end with a sprocket 92, which, by means of a chain 93, (see Figs. 5 and 7,) is actuated by a sprocket 94 on the hub of a hand-wheel 95, mounted on the shaft 96.

It will now be understood that the shovel 39 may after being brought to proper position vertically and laterally opposite an oven be projected into the oven and forced against the mass of coke 31 therein, and when in such position the shovel may be oscillated or partially rotated, so as to break up the coke. Continued advancement of the shovel will result in filling it, after which the shovel will be withdrawn to the position shown in Figs. 1 and 2. Then it will be oscillated to the position shown by dotted lines in Fig. 9, so as to dump the coke into the hoisting bucket or skip 100. In order that the coke may be guided from the shovel into the bucket 100, I may employ a tilting chute 98, pivoted to the operator's platform, as at 99, said chute being adapted to be thrown or turned by the foot or hand of the operator from the full-line position shown in Fig. 9 to the dotted-line position, or return. When in the full-line position, it will cause the coke which has been dumped therein to slide into the bucket. By throwing it to the dotted-line position any coke remaining therein will be thrown into the bucket.

I will now describe the means for elevating the bucket, so that the coke deposited therein may be raised and caused to deposit the coke into the upper end of a delivering-chute 105^a. The bucket is provided at each side with rollers 101 and 102. The rollers 101 are mount-

ed on the ends of a shaft 132, which extends through the side walls of the bucket, and the rollers 102 are mounted on the ends of a shaft 133, mounted in bearings 134, projecting from the rear of the bucket. The said rollers are adapted to engage suitable flanges of the hoisting-tower 105, as shown in Figs. 9, 10, and 11. Near the rear of the bucket are eyes 103, to which are connected hoisting-ropes 104, which pass over hoisting-drums 106, secured to the worm-wheel shaft 110. (See also Fig. 3.) The shaft 110 has a worm-wheel 109 secured to it, said shaft being supported in bearings 111. (See Fig. 2.) The worm-wheel 109 is driven by a worm 112 on the shaft 113, mounted in bearings 114. (See Figs. 3 and 9.) Secured to said shaft 113 is a sprocket 115, connected by a chain 116 with a sprocket 117 on the shaft 118, mounted in bearings 119, suitably supported by the frame of the machine. Said shaft 118 is provided with a bevel-gear 120, meshing with a bevel-gear 121, (see Fig. 12,) the shaft 122 of which is mounted in bearings 123. A sleeve 125 on the shaft 122 is provided with two friction-bevels 124 124, adapted when the sleeve is shifted to alternately engage a friction-bevel 126 on the end of shaft 70. It will now be understood that by engaging one or the other of the bevels 124 124 with the friction-bevel 126 on the shaft 70, which is actuated by the motor 73, the drums 106 will be rotated in one direction or the other to raise or lower the bucket 100. As the bucket moves upward it retains its horizontal position until it reaches nearly the upper end of the hoisting-tower 105. Two guides 107 and 108 (see Figs. 3, 9, and 11) are secured at the upper portion of the hoisting-tower, said guides being formed with track-flanges adapted to take the traction of the rollers 101 and 102 as the bucket moves upward, so as to cause said bucket to first project its end over the upper end of the delivering-chute 105^a and to then oscillate to the position shown by dotted lines in Fig. 9 to discharge the coke into said chute. In order to shift the sleeve 125, as hereinbefore mentioned, the said sleeve is provided with an arm 127, (see Fig. 3,) connected by a rod 128 (see Fig. 2) with a bell-crank 129, having a rod 130, (see Fig. 3,) connecting it with a hand-lever 131. (See Figs. 2 and 3.)

Referring now to Figs. 2, 3, 5, and 12, particularly Fig. 3, I will describe the means for propelling the apparatus along the rails 38. The rear end 70^a of the shaft of the motor 73 is supported in a bearing 143, supported by a suitable bracket. On the shaft 70^a are bevel-pinions 135 135. Between said pinions is a double clutch 136, splined on the shaft 70^a, the clutch-faces being adapted to cooperate with mating clutch members carried by the hubs of the pinions 135. The double clutch 136 is provided with a ring 137, which is engaged by the yoke 138, carried by the rock-

shaft 139, said rock-shaft having a lever 140, connected by a rod 141 with a hand-lever 142. A vertical shaft 144 is mounted at its upper end in a step-bearing in the bracket of the bearing 143 and at its lower end is mounted in a bearing 146. The shaft 144 has a bevel-gear 145, engaged by the bevel-pinions 135 135, and therefore the shaft 144 will be rotated in either direction, according to which pinion 135 is clutched to the motor-shaft 70^a. Below the bearing 146 the shaft 144 is provided with a bevel-pinion 147, meshing with a bevel-gear 148 on the shaft 150, mounted in suitable bearings 151. (See Fig. 1.) The shaft 150 is provided with spur-pinions 152, meshing with spur-gears 153 on the axle 154 of one pair of the wheels 37.

Referring particularly to Figs. 6 and 12, the outer or stationary part of the carriage-frame is indicated at 160. Inside of the portion 160 and vertically adjustable relative thereto, as presently described, is the suspended part 161 of the carriage-frame. This portion 161 supports the mechanism for actuating the shovel, and said portion of the frame is vertically adjustable in order to bring the shovel to the proper height for entering an oven. Four suspension-rods 162 are secured at their lower ends by pins 163^a to the frame 161. As shown in Figs. 1, 2, 3, 4, 5, and 12, the upper portions of the rods 162 are screw-threaded, and upon the screw-threaded portions are fitted bevel-gears 162^a, which act as nuts to secure the suspension-rods and the suspended part of the carriage-frame in the desired vertical position. The bevel-gears or nuts 162^a rest on supports 163 of a part of the frame. The nuts 162^a are engaged by bevel-pinions 164 at the ends of two shafts 165, mounted in bearings 166. Each shaft 165 is provided with a sprocket 167, connected by a sprocket-chain 168 with a sprocket 169, mounted on the shaft 70 and adapted to be connected with said shaft, so as to be driven thereby by means of a clutch member 170, adapted to be engaged by the clutch 69. These clutches may be independently controlled by suitable levers, so that either one shaft or the other may be actuated so that the suspended part of the carriage-frame may be elevated more at one side than the other, so as to vary the angle of the shovel and its handle relatively to the floor of the oven to be operated upon. It will now be understood that when a given elevation of the shovel has been obtained it may be inclined upward or downward, so as to operate exactly level with the floor of the oven or to work upward therefrom or downward thereupon at an angle relatively to the floor of said oven. In Fig. 4 the side members of the fixed part of the carriage-frame are indicated at 175, the cross-channels of the suspended table or portion of the carriage-frame being indicated at 176.

Suitable controllers for the motors are indi-

cated at 177 and 178 in Fig. 3, said controllers being mounted on the floor or platform 181 for the operator. The roof 179 of the operator's cab and the end 180 thereof are indicated in Figs. 1 and 3. As will be seen, the delivery-chute 105^a is above the roof of the cab.

Referring to Fig. 1, an incandescent lamp is indicated at 182, said lamp being adapted to be placed in or through the charging-hole of the oven to enable the operator of the machine to properly inspect the progress of the work of the shovel within the oven. Said lamp is shown as supported by a pulley 183, the pulley being supported upon a cord 184. Supported in brackets or bearings 194 and 195, attached to the frame of the machine, is a leg or pivot 193, having a bracket-arm or runway 187. A support for the outer end of the arm or runway 187 is shown at 188. Mounted on the runway 187 is a roller or trolley 185. The position of this trolley lengthwise of the runway 187 is controlled by a cord 189, extending over a pulley 190 at the outer end of the runway and a pulley 191 at the inner end of the runway, the ends of said cord 189 being connected to the trolley 185. The cord 184, which supports the incandescent lamp, is secured at one end to the outer end of the runway, extends under the pulley 183 of the lamp, then over a pulley suspended from the trolley 185, then over the pulley 191, and down to a fastening-cleat 186. The lamp-bracket comprising the leg 193 and the runway 187 may be swung about the axis of the leg 193 by means of a handle 196. It will now be understood that the position of the lamp 182 may be varied to any extent to meet the requirements as to its location relatively to the machine, so that it may be properly suspended within or lowered through the charging-opening of the oven.

Having described the operations of the several parts of the mechanism in connection with the description of the construction of such mechanism, a further description of the operation of the machine will not be necessary.

I claim—

1. A coke-drawing machine comprising in its construction a shovel having a flat bottom and mounted so as to be rotated or oscillated on an axis extending lengthwise of said shovel, means for reciprocating the said shovel, and power mechanism for turning it on said axis.

2. A coke-drawing machine comprising in its construction a shovel, means for reciprocating said shovel, means for varying the angle of the reciprocations relatively to the frame of the machine, and means for turning the shovel.

3. A coke-drawing machine comprising in its construction a shovel, means for reciprocating said shovel, a basket, and means whereby the shovel may be turned when within the oven to loosen the coke, or when withdrawn from the oven to dump coke into said basket.

4. A coke-drawing machine comprising in its construction a shovel, means for reciprocating said shovel, a basket, and means whereby the shovel may be turned when within the oven to loosen the coke, or when withdrawn from the oven to dump coke into said basket, means being also provided for hoisting the basket to a suitable point for delivery.

5. A coke-drawing machine comprising in its construction a shovel having a straight operating edge and mounted so as to be rotated or oscillated on an axis extending lengthwise of said shovel, power mechanism for reciprocating and turning the shovel, and means for vertically adjusting the plane of the reciprocations of the shovel.

6. A coke-drawing machine comprising in its construction a shovel, means for reciprocating the shovel, means for vertically adjusting the plane of the reciprocations of the shovel, and means for varying the angle of said plane.

7. A coke-drawing machine having a shovel angular in cross-section and mounted to oscillate on a longitudinal axis, power mechanism whereby the shovel may be turned to pry coke from the bed of an oven, and means whereby the shovel may be actuated to lift and remove from the oven coke so pried up.

8. A coke-drawing machine comprising in its construction a shovel having a handle provided with teeth, an internally-threaded rotary actuator for said handle, and means for rotating said actuator.

9. A coke-drawing machine comprising in its construction a shovel having a handle provided with teeth, an internally-threaded rotary actuator for said handle, means for rotating said actuator, and means whereby the said handle may be turned without disturbing the connection between its teeth and the internal threads of said actuator.

10. A coke-drawing machine comprising in its construction a shovel having removable teeth at its front edge, and means for reciprocating said shovel.

11. A coke-drawing machine comprising in its construction a shovel angular in cross-section, and mounted to oscillate on a longitudinal axis, power mechanism for turning the shovel on such axis, means for reciprocating said shovel, and means for swinging the shovel about a substantially vertical axis.

12. A coke-drawing machine comprising in its construction a reciprocatory shovel, a guide therefor, and bushings for retaining the shovel in proper position relatively to the guide.

13. A coke-drawing machine comprising in its construction a reciprocatory shovel, a guide therefor, and bushings for retaining the shovel in proper position relatively to the guide, the said bushings being rotatively supported in said guide to permit the shovel to be turned.

14. A coke-drawing machine comprising in its construction a shovel having a toothed han-

dle, an internally-threaded gear the threads of which engage the teeth of the shovel-handle means for rotating said gear, and a thrust-plate against which said gear abuts.

5 15. A coke-drawing machine mounted on wheels, and an inclined trackway to enable the machine to resist the thrust of the coke-drawing implement.

10 16. A coke-drawing machine comprising in its construction a shovel and means for reciprocating said shovel, the said machine being mounted upon wheels, rails being provided for said wheels, the rail under that side of the machine from which the shovel projects
15 being lower than the other rail whereby the trackway formed by said rails will resist the thrust of the shovel.

17. A coke-drawing machine comprising in its construction a shovel, means for reciprocating and turning the shovel whereby the
20 shovel may be caused to lift and withdraw and discharge coke, and conveying mechanism for receiving the coke from the shovel after the latter has withdrawn it from an
25 oven.

18. A coke-drawing machine comprising in its construction a shovel, means for reciprocating and turning the shovel, a receptacle adapted to receive the coke from the shovel,
30 means for elevating said receptacle, and a chute for receiving the coke from said receptacle when the latter is raised.

19. A coke-drawing machine comprising in

its construction a shovel, means for reciprocating and turning the shovel, a receptacle 35 adapted to receive the coke from the shovel, means for elevating said receptacle, and a chute for receiving the coke from said receptacle when the latter is raised, means being provided for tilting said receptacle at the
40 upper portion of its movement to cause the coke to slide therefrom to the chute.

20. A coke-drawing machine comprising a carriage, means supported by said carriage for acting upon the coke in any one of a se- 45 ries of ovens and for withdrawing the coke therefrom, a platform on the carriage for the operator, and a cab structure above said platform, the carriage having also a coke-elevator and a chute for receiving the coke from
50 said elevator, the said chute extending over the roof of the cab structure.

21. The combination with a series of coke-ovens, of a trackway along the front of said
55 ovens, a series of supports projecting from the upper portion of the front wall, a plank connected with said supports, a trolley-wire below said plank, and a coke-drawing machine mounted on and movable along said trackway
60 and having a trolley for said wire.

In testimony whereof I have affixed my signature in presence of two witnesses.

FREDERICK D. BUFTUM.

Witnesses:

GEO. T. LINN,

CLIFFORD PATTERSON.