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M. & H. E. MORTON.

UNIVERSAL SHAPER.

No. 550,004. Patented Nov. 19, 1895.

Fig. 1.

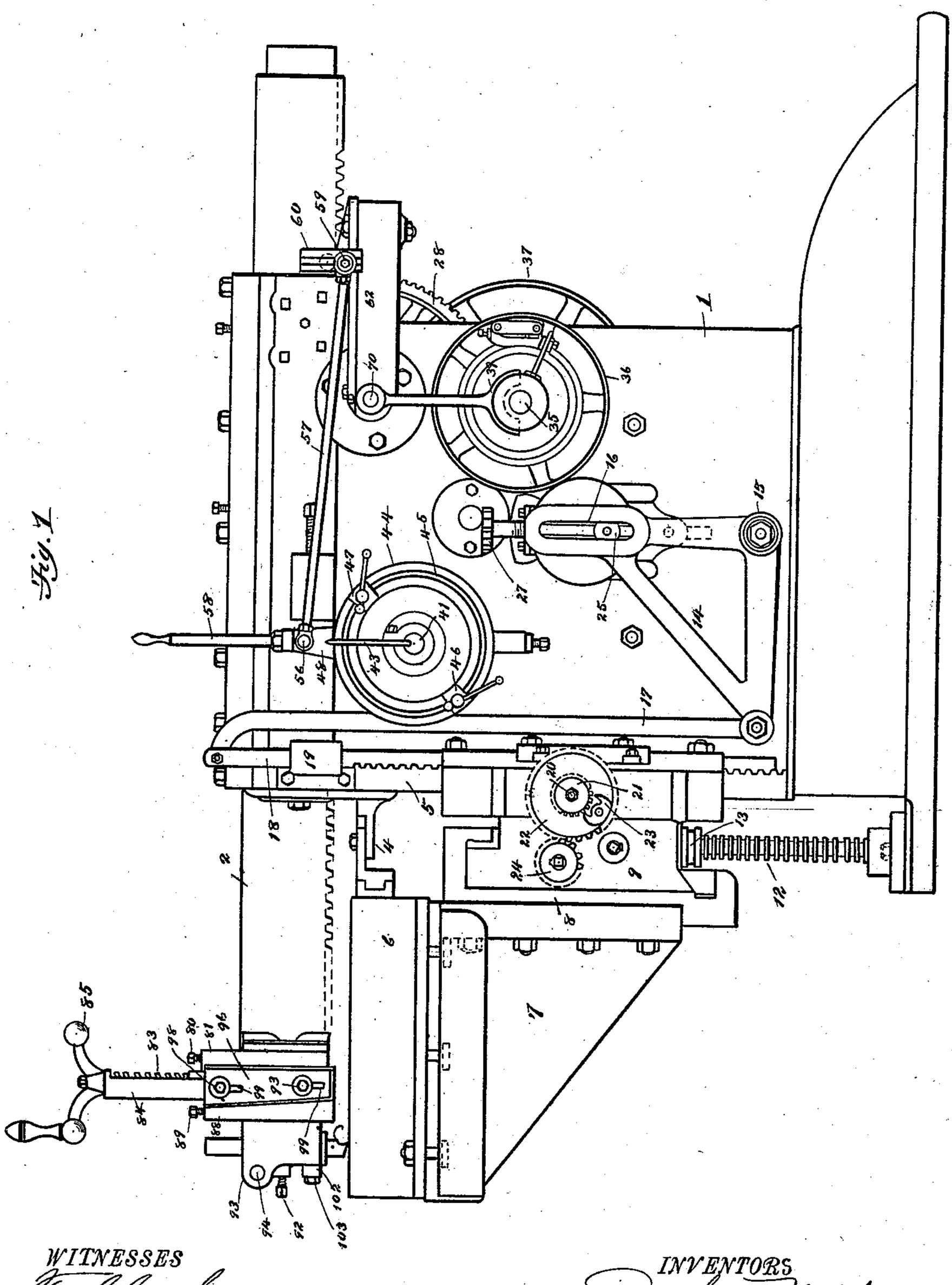

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Fig. 2.

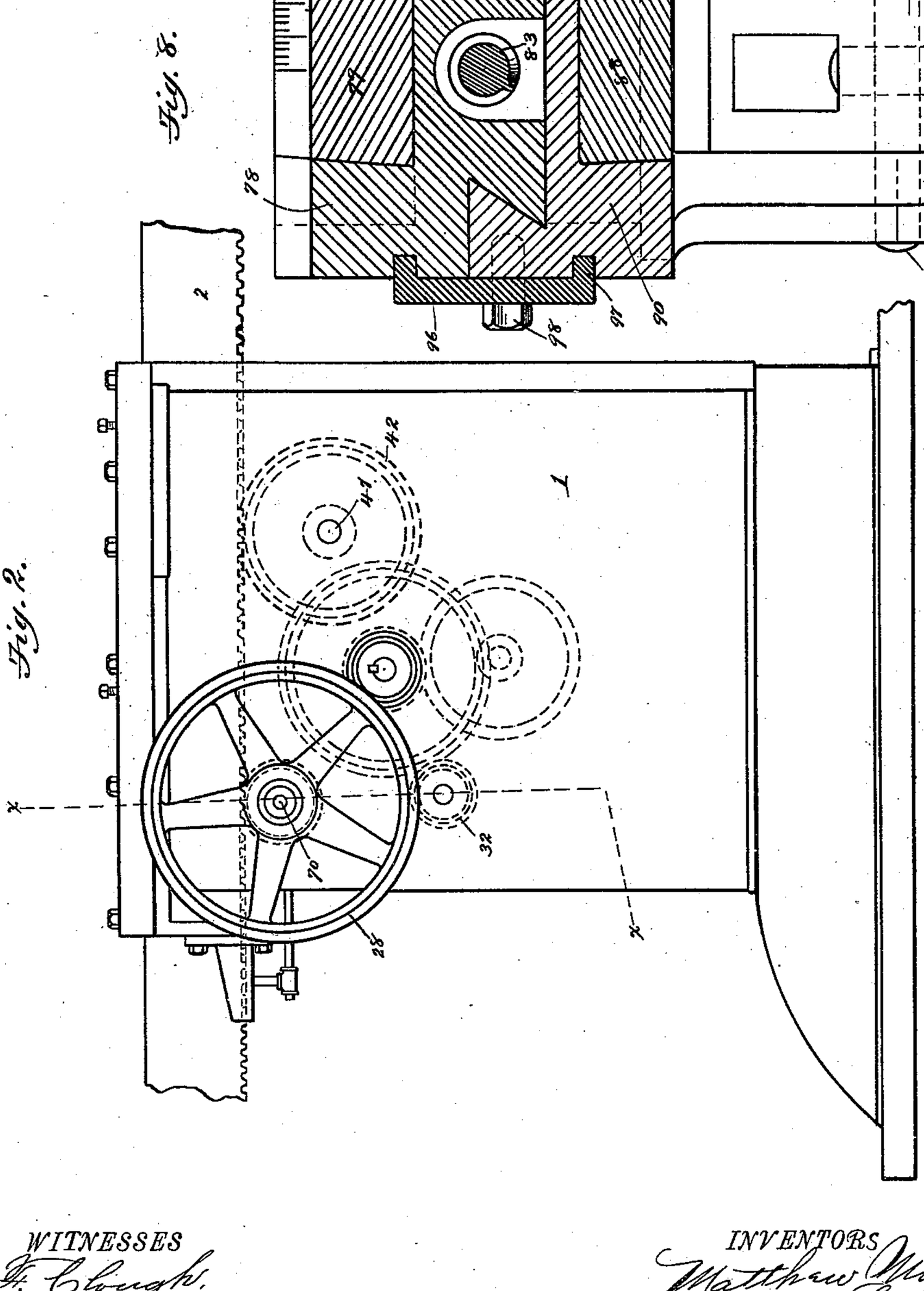

Fig. 8.

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Fig. 3.

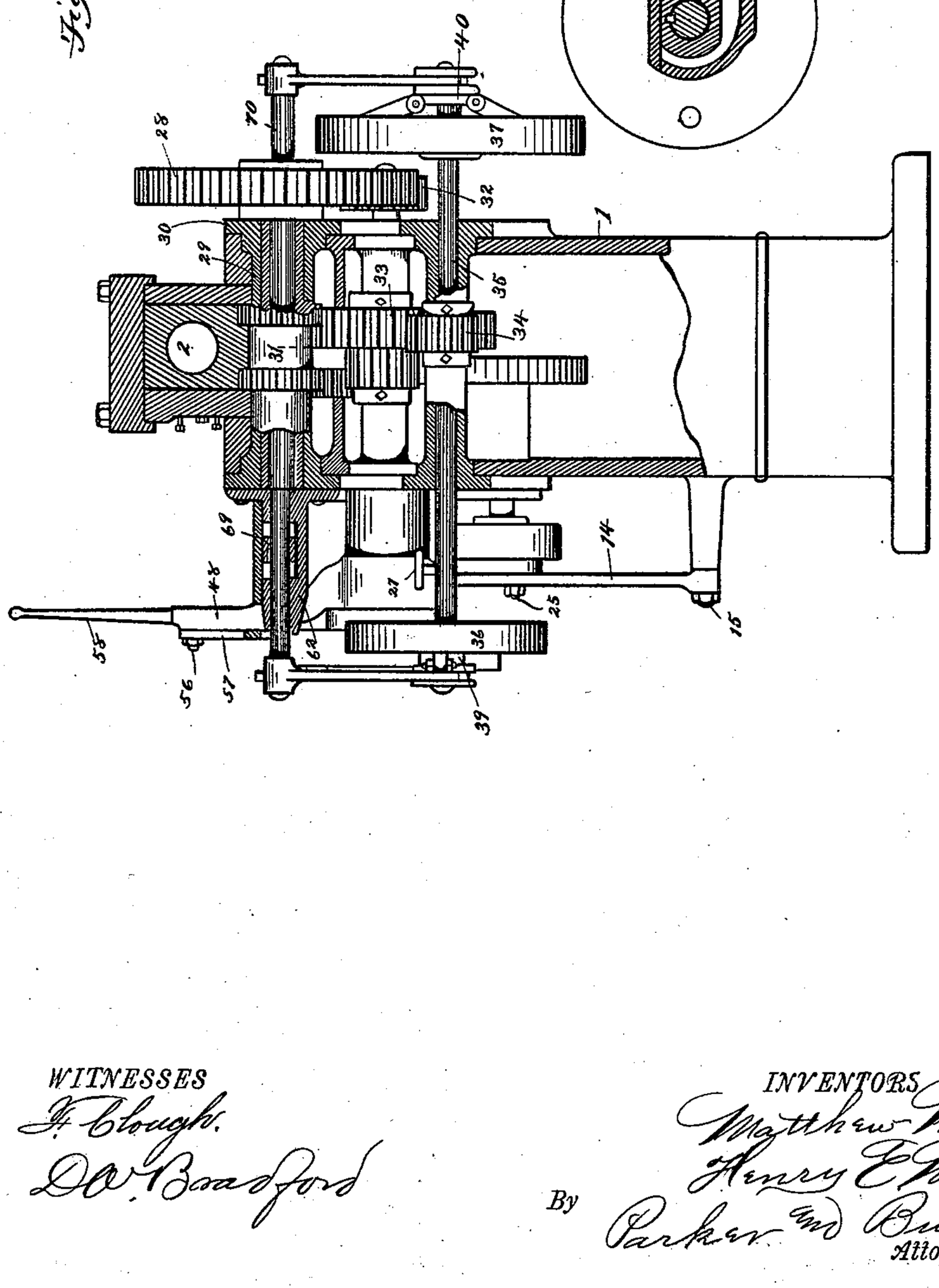

Fig. 17.

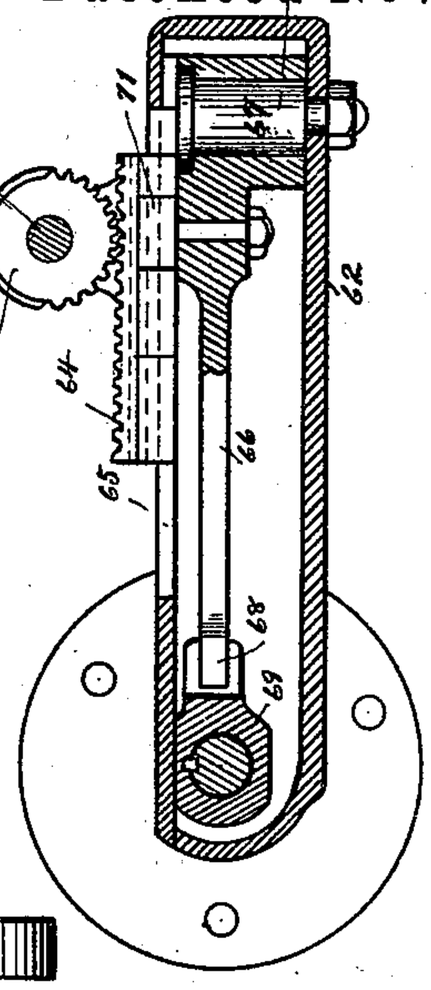

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Fig. 4.

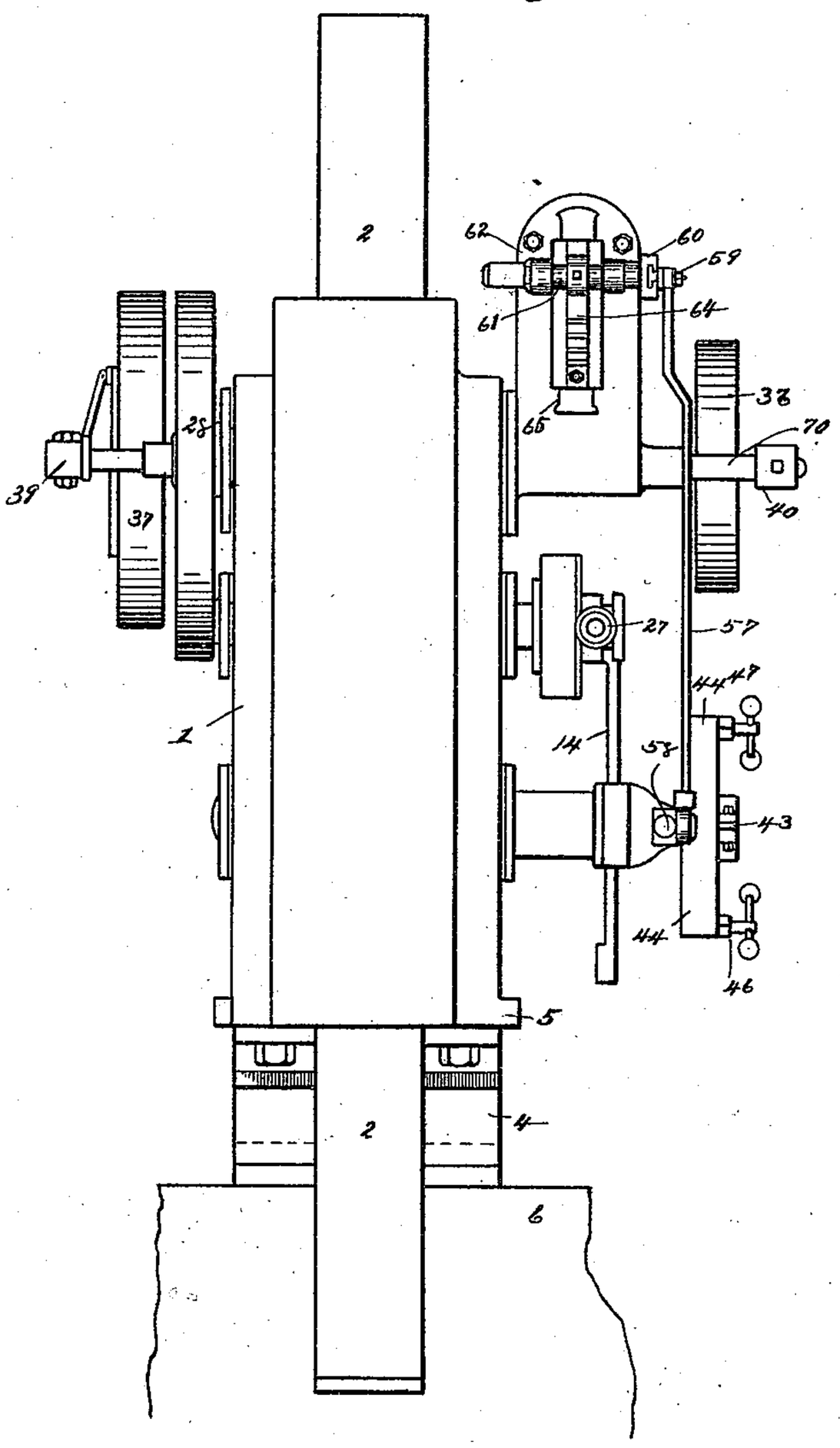

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Fig. 5.

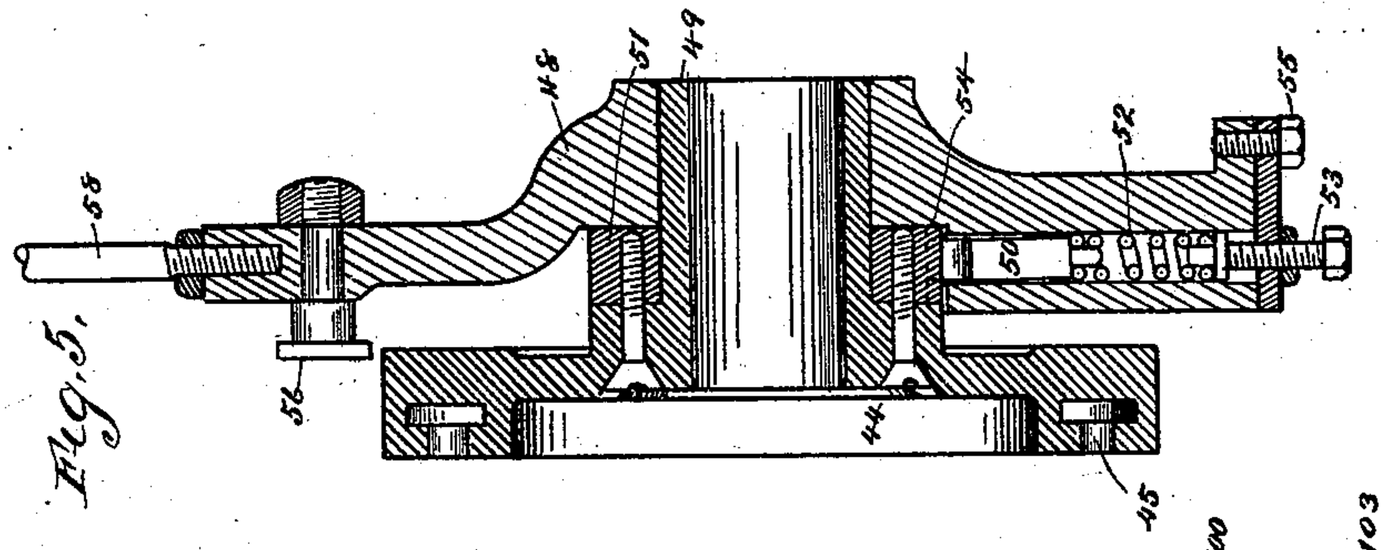

Fig. 6.

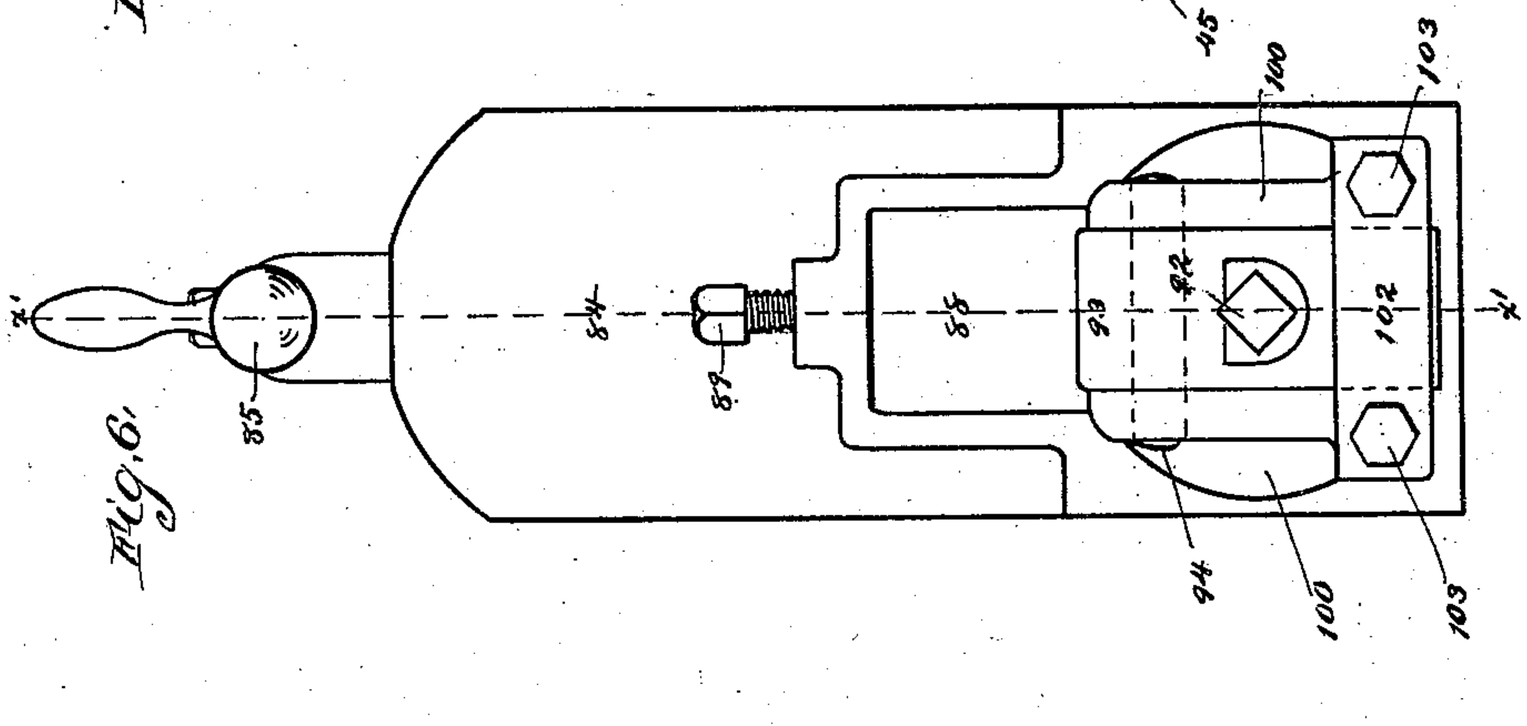

Fig. 7.

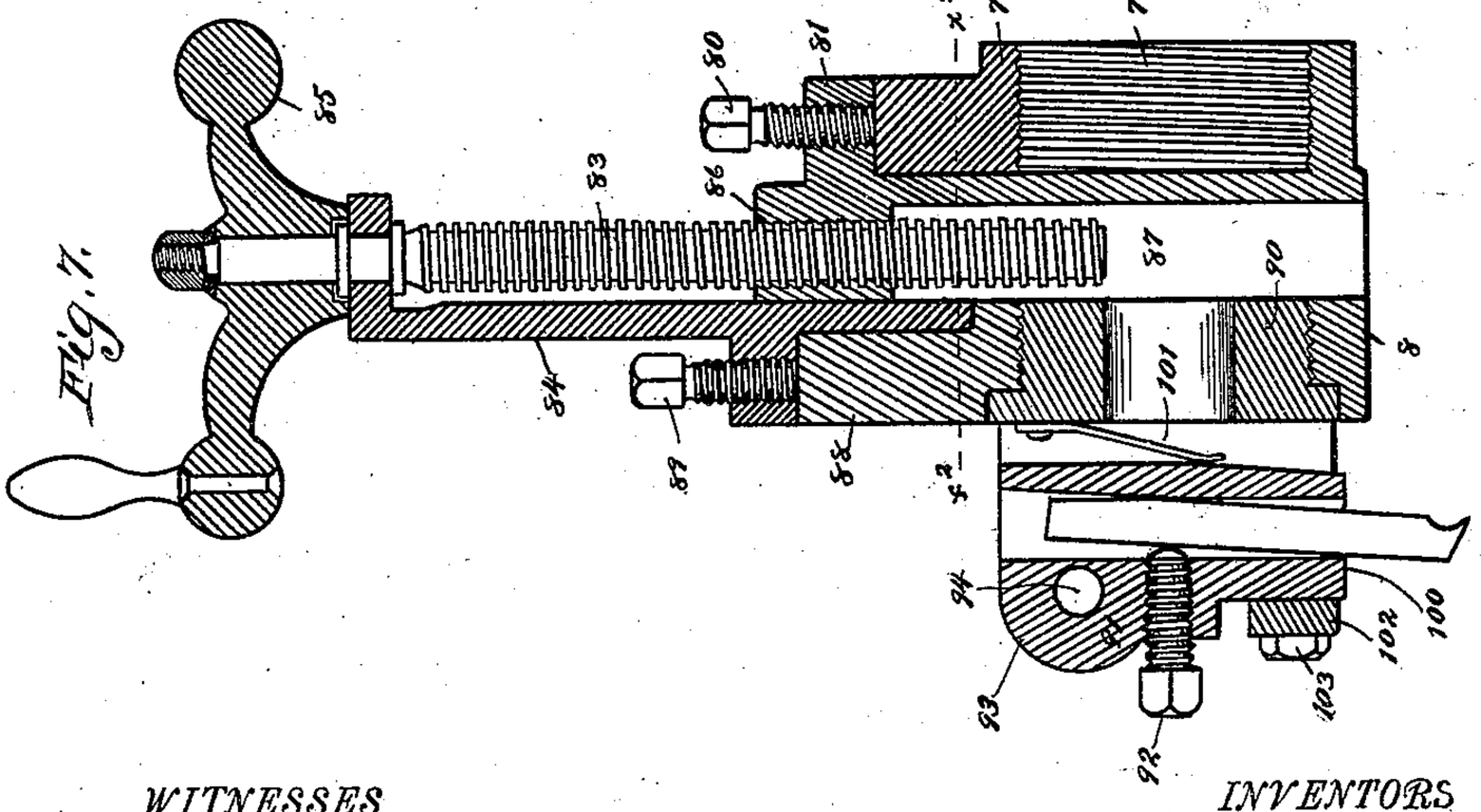

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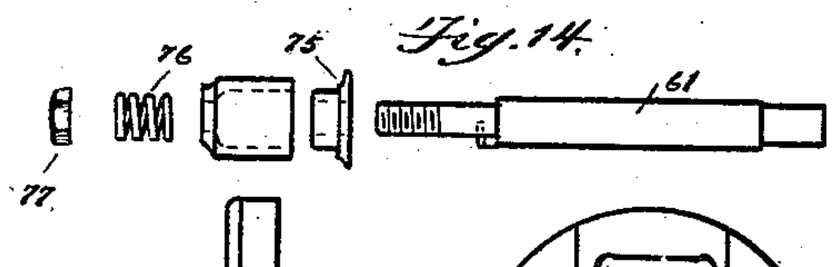
Fig. 14.



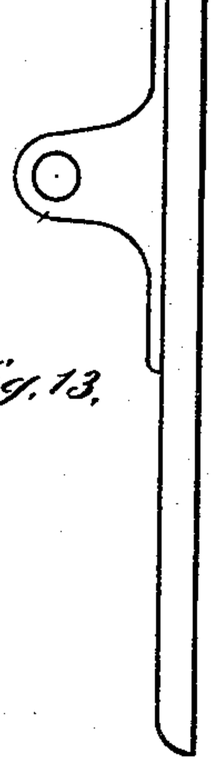


Fig. 13.

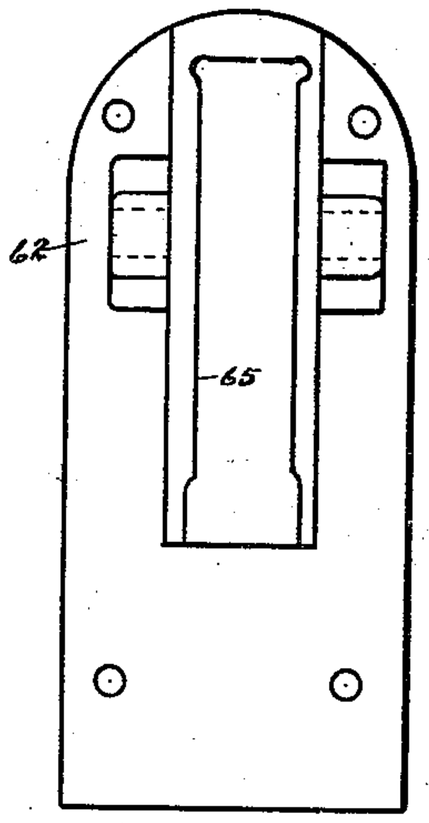


Fig. 10.

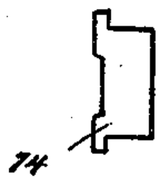


Fig. 15.

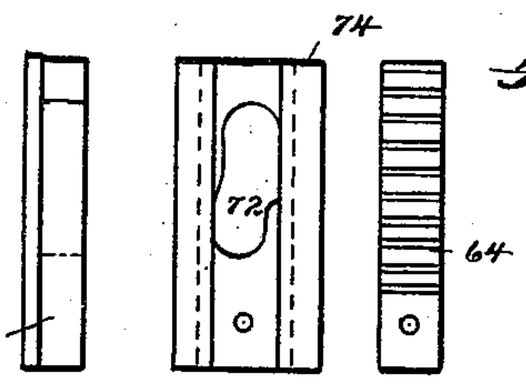


Fig. 16.

Fig. 11.

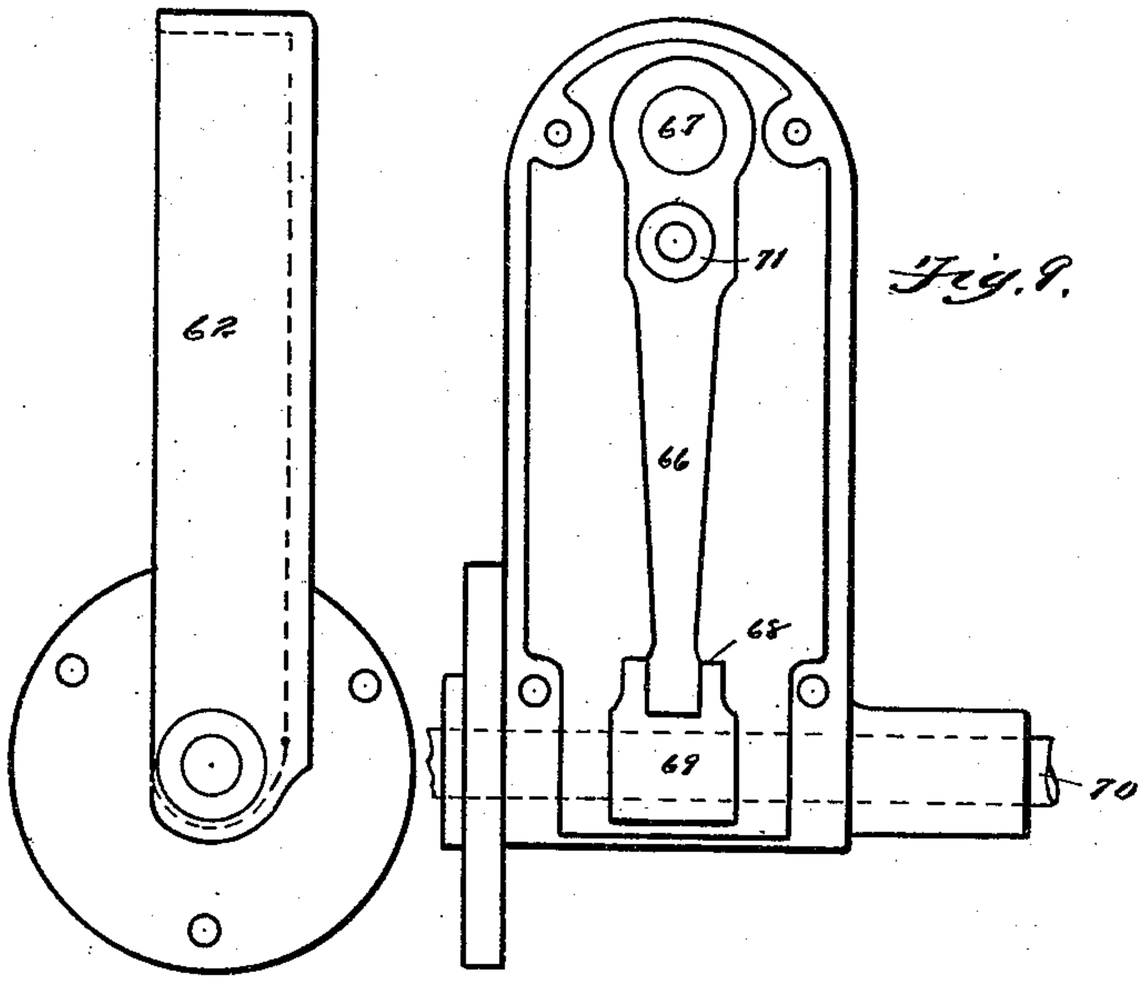


Fig. 9.

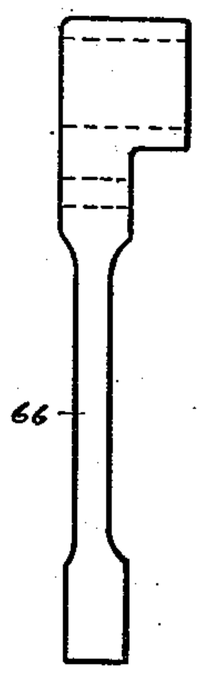


Fig. 12.

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Fig. 18.

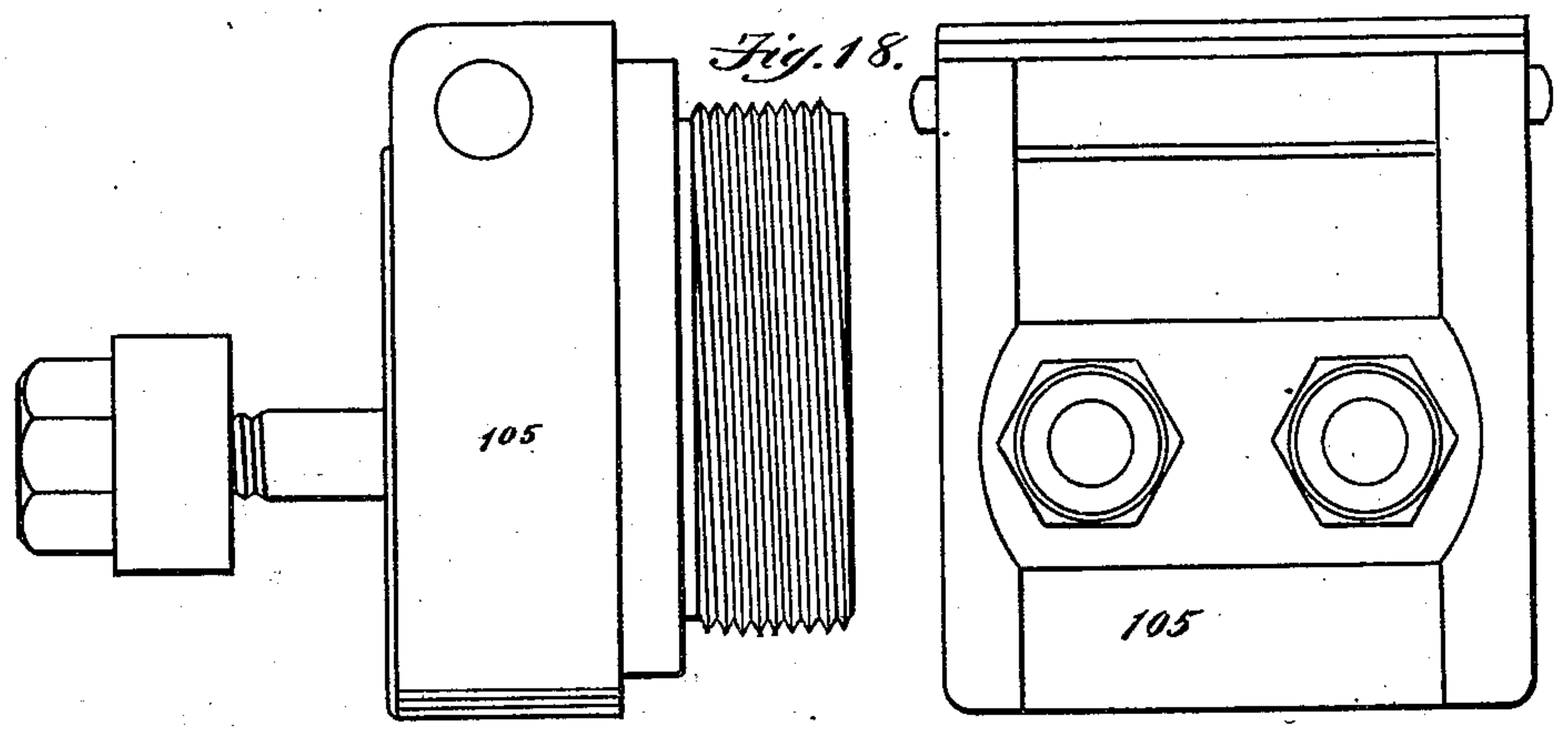


Fig. 19.

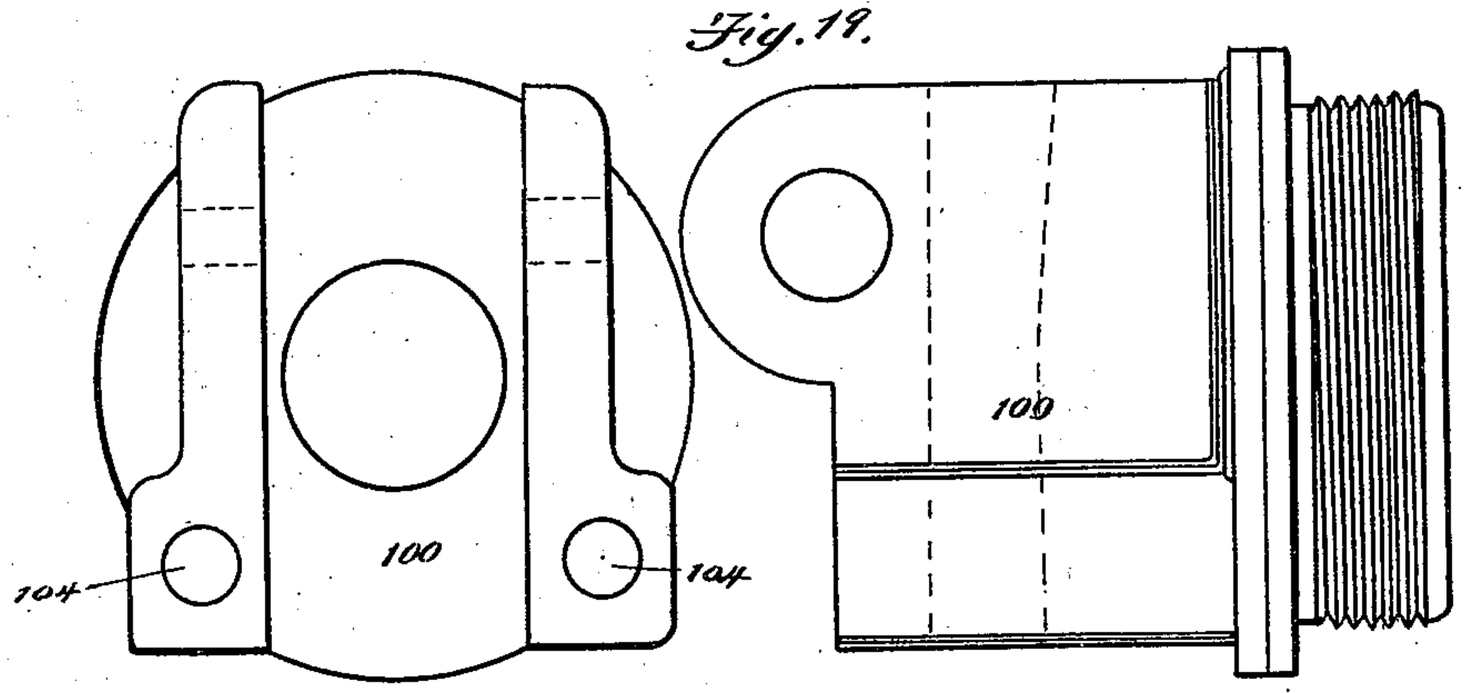


Fig. 21.

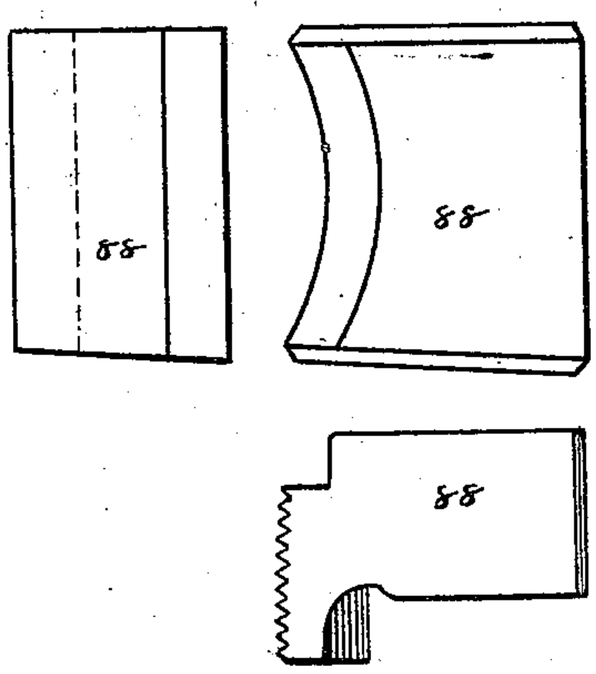
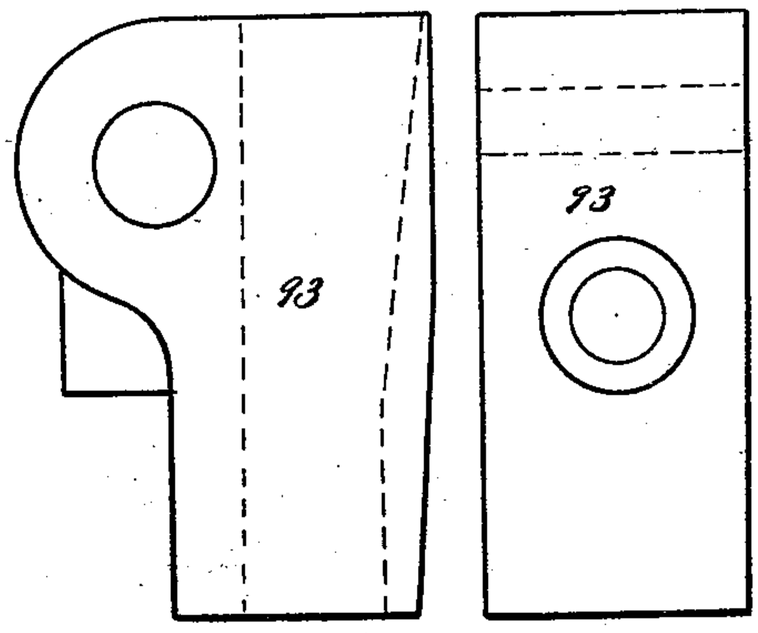


Fig. 20



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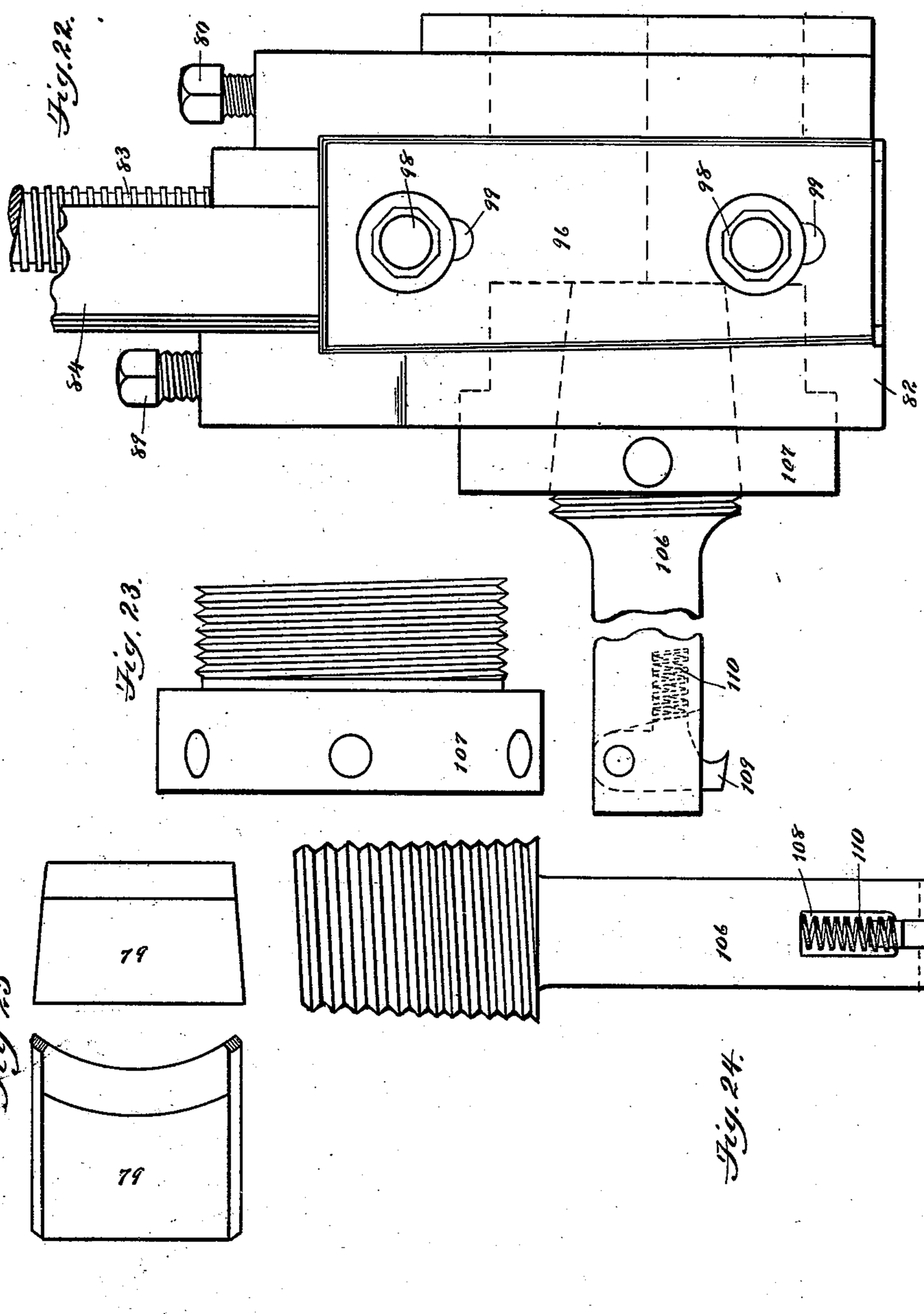

Fig. 22.

Fig. 23.

Fig. 24.

Fig. 25.

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UNITED STATES PATENT OFFICE.

MATTHEW MORTON AND HENRY E. MORTON, OF MUSKEGON, MICHIGAN.

UNIVERSAL SHAPER.

SPECIFICATION forming part of Letters Patent No. 550,004, dated November 19, 1895.

Application filed June 1, 1894. Serial No. 513,185. (No model.)

To all whom it may concern:

Be it known that we, MATTHEW MORTON and HENRY E. MORTON, citizens of the United States, residing at Muskegon, county of Muskegon, State of Michigan, have invented a certain new and useful Improvement in Universal Shapers; and we declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

Our invention relates to shaping-machines; and it consists in the improvements hereinafter specified and claimed.

In the drawings, Figure 1 is an elevation of one side of our improved shaper, showing details of certain portions of the machinery. Fig. 2 is an elevation of the opposite side of the shaper with the table mechanism removed and the ram broken off. Fig. 3 is a partial sectional view of Fig. 2 on the line $x\,x$. Fig. 4 is a plan view of the top of the shaper with a part of the table and the work thereon broken away. Fig. 5 is a sectional perpendicular view through the tappet or shifter wheel and swinging arm. Fig. 6 is a front elevation of the cutter-head. Fig. 7 is a sectional elevation of the same on the line $x'\,x'$. Fig. 8 is a transverse section on line $x^2\,x^2$ of Fig. 7. Figs. 9, 10, 11, 12, 13, 14, 15, 16, and 17 illustrate details of the reversing mechanism. Figs. 18, 19, 20, 21, 22, 23, 24, and 25 illustrate the construction of the head and combination.

In carrying out our invention 1, 2, and 7 represent, respectively, the frame, the ram, and the table of our improved shaper.

4 represents an adjustable bearing placed between the column 5 of a frame and the work 6, which is located upon the table 7 and appropriately secured thereon in the manner common to such constructions. The bearing 4 is for the purpose of relieving the strain which would otherwise occur upon the bearings attached to the saddle 8 and the cross-bar 9 and confining all of the thrusts practically between the tool and the frame of the machine, thus preventing twisting strains upon the lower connections due to a drawing cut and removing the strains from the gibs on the cross-bar, as the strains are transferred directly to the frame 1 in consequence of the work abutting against the bearing 4. Hence the work does not need to be bolted as rigidly upon the table 7. In consequence, springing of the work is avoided and perfectly-accurate work insured. Other advantages will also be apparent to those who are skilled in the art.

7 represents the table, which is gibbed and fitted over the saddle 8. The saddle is gibbed to a cross-rail 9. A raising and lowering screw 12 is adapted to raise and lower the cross-rail, carrying with it the table 7. This elevating-screw is preferably provided with ball-bearings at its upper end at 13, the lower end being the nut in which the screw engages. The feeding device, in connection with the cross-rail, consists in a triangular bell-crank arm 14, pivoted at 15, and having formed therein at one extremity a slot 16. The opposite end is pivoted to a connecting-rod 17, pivotally attached at its upper end to a rack-bar 18, operating in bearings 19 attached to the frame. The rack-bar 18 engages a pinion, (not shown,) but which is rigidly attached to a shaft 20. This shaft rigidly engages a ratchet-wheel 21 at its outer extremity. Loosely engaging the shaft is a spur-wheel 22, and upon this spur-wheel is attached a reversible spring-ratchet 23, of the ordinary form. It is obvious that the rotation of the shaft 20 by the rack-bar in one direction would revolve the spur-wheel 22, and that a reverse motion would permit the pinion 21 to revolve freely under the ratchet and thus create an intermittent motion in the spur-wheel 22. This intermittent motion is transferred to pinion 24, which is rigidly attached to a transverse screw, which, by means of appropriate nuts attached to the saddle, furnishes a transverse feed. This motion may be transferred from the same shaft by an appropriate gearing to a continuation of the upper end of the screw 12, by which the perpendicular feed may also be secured. As this detail of mechanism with regard to the feed is neither new nor original with us, and as we do not desire to claim it, and as the same may be varied to suit different circumstances or wishes of different individuals, we do not describe it in detail.

In the slotted end 16 of the bell-crank lever

14 there reciprocates, by means of an appropriate bearing, a wrist-pin 25, which pin is carried adjustably in a slot in a rotating disk and governed therein by a screw and hand-wheel 27. Appropriate gearing connects the shaft of this disk with the driving mechanism.

It is obvious that the adjustment of the wrist-pin, by means of the screw and hand-wheel, will vary the movement of feed in accordance with the throw of the adjustable crank, thus operating upon the bell-crank lever 14.

In Fig. 3 is shown the main portion of the driving and reverse gear and their relations by breaking away a portion of the rear end of the frame, upon line *x x* of Fig. 2, and also showing certain portions of the details in section. 28 is the main driving gear-wheel, consisting of a spur-wheel rigidly attached to a hollow shaft 29, which passes through the upper portion of the frame 1 and is journaled therein by appropriate bearings 30. These bearings are made very long, virtually covering the whole of the shaft, except that portion to which is attached the double spur-pinion 31, each portion of which engages in two rabbeted toothed racks cut in the lower edges of the ram. This main driving-gear 28 receives its motion through a pinion 32, communicating with the internal gearing 33, engaging with the pinion 34 and shaft 35, appropriately journaled in a frame, and carrying at either end two friction-clutch pulleys 36 and 37, of unequal diameters. These pulleys operate loosely upon shaft 35, except as they are brought into engagement with the clutches 39 and 40, rotating rigidly with the shaft. The particular form of these clutches is not material to our invention and we lay no claim whatever thereto. Any appropriate form of clutch or friction pulley may be used which may be suitable for the purpose.

The two clutch-pulleys 36 and 37 are connected by appropriate bands to pulleys upon counter-shafts (not shown) and derive their motion therefrom. By such means they are caused to rotate in opposite directions, and, owing to the difference in the diameters of the clutch pulley-wheels 36 and 37, one, if brought in connection with the shaft 35, would rotate it with a slow motion and the other with a fast motion.

It is obvious that by operating the clutches 39 and 40 alternately each clutch-pulley may be brought in connection with the shaft 35, so as to give it the motion of the pulley, and that the motion of the planer can be reversed by this means.

The reversing-gear consists of a shaft 41, carrying thereon and in engagement with one of the racks formed on the ram a spur-wheel 42. (Shown in dotted lines in Fig. 2.) This spur-wheel has a greater circumference than the full length of travel which is given to the ram, with the result that the wheel 42 does not make a full revolution while the ram is making a full stroke. The shaft 41 extends through one side of the frame and carries at its extremity, rigidly attached thereto, a pointer 43. The rotation of the shaft 41 would therefore compel a corresponding rotation of the pointer 43.

Loosely engaging the shaft 41 and concentric with it is a tappet or shifter wheel 44. (Shown in Figs. 1 and 4 and illustrated in section, together with its attachments in Fig. 5.) The wheel has a continuous concentric slot 45 cut in its outer face and carries therein adjustable tappets 46 47. By means of the shaft 41 and the pointer 43 the motion of the ram is practically registered by the pointer upon the shifter-wheel 44, and the tappets 46 and 47 are so adjusted upon the shifter-wheel that the pointer would come in contact with one of them at the end of the stroke in either direction, and, as hereinafter shown, the length of the stroke can be governed entirely by the adjustment of the tappets and at the same time reversed thereby.

48 is a swinging arm (shown in sectional detail in Fig. 5) and which is bored out to slip over the hub 49 of the shifter-wheel and upon which it may revolve, except as prevented by the means hereinafter described. In the lower end of the arm in a recess there is provided a plunger 50, held up to a position against a ring 51 by means of a spring 52 and set-screw 53. The ring 51 has a V-shaped notch cut across its face at 54, and is held firmly to the shifter-wheel by the screws 55. It is so adjusted that when the parts are in position, as shown in Figs. 5 and 1, the plunger 50 engages in the notch 54, and thus, to the degree of resistance which it would require to throw it out of the notch against the tension of the spring, locks the shifter-wheel and swinging arm 48 together and some force would be required to compel their disengagement. This forms a positive release, guarding against any slipping of belts or derangement which otherwise would cause the parts to break.

On the opposite end of the swinging arm 48 is a wrist-pin 56, upon which is pivoted a connecting-rod 57. A further extension of the swinging arm constitutes a handle 58, by which the reverse may be operated by hand at any point of the stroke.

It will be observed that the operation of this portion of the mechanism is that the length of the strokes is preliminarily adjusted by means of the adjustable tappets in their relations to the circumference of the shifter-wheel and the pointer. The shifter-wheel does not revolve with the shaft 41 until, in the revolution of the pointer being attached to the shaft, it strikes the tappet corresponding with the direction of that revolution, when it at once compels the shifter-wheel to rotate, carrying with it the swinging arm and the connecting-rod 57, which, by means of mechanism hereinafter described, reverses the operation of the machine when the arm commences to travel in the opposite direction

until the pointer is brought against the opposite tappet, thus compelling a movement of the shifter-wheel and another reversal of the mechanism.

The reversing mechanism at the opposite end of the machine is shown in elevation in Fig. 1, a general plan view in Fig. 4, an end elevation in partial section in Fig. 3, and a longitudinal sectional view upon line *y y* of Fig. 3 in Fig. 16. Views of the details are shown in Figs. 8, 9, 10, 11, 12, 13, 14, and 15.

The connecting-rod 57 at its rearward extremity connects with a wrist-pin 59, which is made adjustable in a crank-arm 60. This crank-arm is rigidly attached to a shaft 61, rotating in bearings in a casting in the form of a box 62, and in which is placed the shifting mechanism. The shaft 61 carries a pinion 63, which engages in a rack 64, sliding in a longitudinal opening, and has a bearing 65 in the box 62. The partial rotation of the pinion would compel the rack to move longitudinally to and fro in the bearing referred to. Within the box 62 is a horizontal swinging arm 66, and which is pivoted vertically at one end at 67. The opposite end engages at 68 pivotally in a clutch 69, embracing the shifter-bar 70, which extends through the hollow driving-shaft 29. Each extremity of the shifter-bar carries a depending yoke engaging the clutch mechanism upon shaft 35, which operates the pulleys 36 and 37.

It is obvious that the shifter-bar 70 will throw the clutches in or out, and thus engage pulleys 36 and 37 alternately. At a point between the pivot 67 of the swinging arm 66 and its extremity at 68 is mounted upon a vertical pivot a friction-roller 71. The under side of the rack 64 is formed into a peculiar irregular slot 72, as shown in Fig. 14, in which the friction-roller 71 engages. The longitudinal motion of the rack 64, it being held closely in its bearings 65 in the upper portion of the box 62, compelling the friction-roll 71 to occupy the position upon either side of the central irregular slot, would necessarily compel the swinging arm 66 to oscillate horizontally upon its pivot 67, and by means of its engagement by intermediate connections with the shifter-bar 70 would compel this to reciprocate longitudinally and operate the clutches and the clutch-pulleys, as hereinbefore described. This mode of providing for the reciprocation of the shifter-bar forms a lock at each end of the irregular slot 72, by which the shifter-bar is positively prevented from releasing the clutches.

For convenience of construction the rack is made in two pieces, 64 being a rack bolted upon the top of the block 74, in which is cut the irregular slot 72.

It is obvious that the longitudinal motion of the rack 64, created as it is by the rotation of the pinion 63, can be varied by means of the shifting wrist-pin 59. The crank-arm 60 can be continued below its engagement of the shaft 61, and by dropping the wrist-pin 56 below the center a reverse-crank can be obtained. Upon the inner end of the shaft 61 is formed a friction mechanism by means of a friction-collar 75, held up by a spring 76, inclosing the shaft and compressed by a cap-nut 77. This forms a friction on the side of the bearing, and by tightening the cap-nut the friction can be increased or diminished. The purpose of this is to overcome the backlash and to hold the reversing mechanism locked.

From the description of the foregoing details the manner of operation of the reversing-gear can be readily seen, and that by operating the handle 58 the ram can be reversed or stopped and started at any part of its stroke.

Fig. 1 shows the machine set for a pulling or drawing cut, and in order to reverse it and make it a pushing-cut shaper all that is necessary to do is to change the heads upon the ram, and by shifting the wrist or crank pin to the opposite side of the crank-arm 60 the motion of the shifter is reversed, when, by means of the appropriate belting, the machine becomes a pushing-cut shaper. There is an intermediate position in the reversing in which both clutches upon the friction-pulleys are out, and, consequently, a point at which the handle 58 can be set when the machine would entirely cease its motion, as neither pulley would be driving.

Fig. 6 is a front elevation of the head 3, and Fig. 7 is a sectional view of the same on the line *x x* of Fig. 6.

Fig. 8 is a transverse sectional view on the line x^2 x^2 of Fig. 7.

78 is a block interiorly threaded, as shown in Fig. 7, for the purpose of receiving the head of the ram. In the upper face of this block is a plug 79. (Shown in cross-section in Fig. 25.) This block fits in a dovetailed slot, its lower face being threaded to correspond with the threads of the block 78, and thereby to engage the screw upon the head of the ram. The outer face of the plug is controlled by a set-screw 80, passing through a lug 81 on block 78. By means of the set-screw 80 the plug 79 can be forced against the ram at whatever angle the head may be turned, and thus it is rigidly held in position.

A secondary block 82 has cut through it perpendicularly a dovetailed slot and the block 78 is fitted into this, allowing a certain amount of perpendicular motion, which motion is controlled by the screw 83, engaging rotatably in the lug upon a bracket 84 and controlled by hand-wheel 85. This screw engages in block 78 at 86, running in a recess cut through the same at 87. The secondary block 82 is also interiorly threaded, preferably, with the same sized bore and with threads of the same pitch as the block 78. In the upper portion of it is a plug 88, similar in construction and principle as 79. This engages the tool-holder when screwed into place, as hereinafter described, and by means of the set-screw 89 is enabled to fix it in po-

sition. Detail views of the plug 88 are shown in Fig. 21.

One of the tool-holders is shown in section in Fig. 7 and a plan view in Fig. 8. One end of it 90 is threaded to correspond with interior threads in secondary block 82, engaging the same, as shown in Fig. 7 and in dotted lines in Fig. 8. The opposite end at 91 is slotted, and contains a set-screw 92 for holding the tool in position. A relief-block 93 is pivotally attached to the sliding section by a taper-bolt 94, passing through its upper portion and two lugs on the head. The block is slotted, as shown in dotted lines in Fig. 19 and in section in Fig. 7. It carries centrally a set-screw 92, whereby the contained tool may be securely held in place, the block 100 (shown in detail in Fig. 19) and spring 101 (shown in Fig. 7) taking up all lost motion. The relief-block is held in position at its lower edge by a binder 102, held by two bolts 103 103, tapped into the block 100 at 104 104, as shown by Fig. 19.

As shown in elevation in Fig. 1, and in Fig. 8 in section and in an enlarged view in Fig. 22, there are clamps 96 96, provided with raised edges 97 97, adapted to slide in corresponding grooves cut in the sides of main sliding section 82 of the head and the base 78, as shown in cross-section in Fig. 8. These slots are not parallel, but approach from above downward, both sides of the head being alike. Hence, as the clamps 96 96 are moved upwardly they draw the parts rigidly together, taking up all wear and holding them in proper position. The clamps are controlled by screw-bolts 98 98, operating through slotted holes 99 99 in the sides of the clamps and by means of which they can be held rigidly in any adjusted position.

It will be observed that the construction throughout is such that the head swivels upon the ram, and by means of the gripping-blocks 79 88 and side clamps 96 96 all the parts are rigidly bound together when performing work, and yet are easily and perfectly adjustable for all purposes. The form of swivel-head for the pushing-cut is shown in detail in Fig. 18. The swivel-head 105 is inserted into the sliding section 82, and when adjusted clamped by the gripping-block 88. The usual means are provided for holding the tool therein, and hence need not be described.

Figs. 22 to 25 illustrate the special cutter for inside work. Fig. 22 shows an elevation thereof, in which 82 is the sliding section controlled by the set-screw, and 106 is the tool-holder, which is shown broken to indicate that it may be of any assignable length. One end of this screws into screw-collar 107, as indicated by the dotted line in Fig. 22. This collar is shown in detail in Fig. 23. It contains a taper female screw adjusted to receive the taper-screw shank of the tool-holder. When the tool-holder is screwed home, it is thus centered and rigidly held in the screw-collar. The screw-collar is screwed into the sliding section and held by the screw-controlled gripping-block 88. Pivotally held in a mortise 108, at the opposite end of the tool-holder 106, is the cutter 109. One side of the cutter is rigidly held against the end of the mortise against the strain of the cut. The opposite side is elastically held by the spiral spring 110. (Shown in Figs. 22 and 24.) The spring relieves the tool on the back stroke, and enables it to ride freely over the work.

The operation of the machine as a whole is sufficiently obvious from the foregoing description.

It is also obvious that the details of construction can be considerably varied without departing from the principle.

What we claim is—

1. The combination of a reciprocating ram engaging with a shaft adapted to rotate with the reciprocations, a tappet disk and swinging arm adapted to rotate loosely around the shaft, a pointer rigidly attached to the shaft adapted to engage adjustable tappets in the disk, a shifting reverse gear, and means connecting the swinging arm and reverse gear whereby the latter may be actuated by the action of the pointer against the tappets, substantially as described.

2. The combination of a reciprocating ram, a combined swinging arm and tappet disk, means whereby the reciprocations of the ram rotate the tappet disk at either end of the stroke, and an adjustable releasing device interposed between the tappet disk and the swinging arm, which normally locks the two together, whereby they rotate in unison but are adapted to disengage and permit separate rotation under extraordinary strain, substantially as described.

3. The combination of a reciprocating ram, a crank arm fixed upon a shaft, and a sliding irregularly-slotted block, connections between said ram intermittently operating said crank arm, means connecting the crank arm and said slotted block, a lever connected to a shifter bar operating a double clutch mechanism and operated by the reciprocations of the slotted block by means engaging in the slot thereof, and pulleys adapted to be reciprocally engaged by the clutches, whereby the motion of the ram is automatically reversed, substantially as described.

4. The combination of a reciprocating ram, a crank arm fixed upon a shaft, and a sliding, irregularly slotted block, connections between said ram intermittently operating said crank arm, means connecting the crank arm and said slotted block, a lever connected to a shifter bar operating a double clutch mechanism and operated by the reciprocations of the slotted block by means engaging in the slot thereof, pulleys adapted to be reciprocally engaged by the clutches, and a hand lever whereby the motion of the ram may be arrested or reversed, substantially as described.

5. In a reverse mechanism for shapers, the

combination of a shaft, a sliding block, means connecting the two whereby the partial rotation of the shaft reciprocates the block provided with an annular slot therein substantially as described, a lever, means substantially as described whereby the lever is kept in engagement with the slot in said block, and means substantially as described connecting said lever with a shifter bar adapted to reverse the motion of the machine and to lock the parts in position at all times, substantially as described.

6. In a rotatable tool holder for a shaper, the combination of a ram having a threaded extremity, a hollow base for a tool holder having a corresponding internal screw adapted to engage the threaded end of the ram and to rotate thereon, and a jamming block setting in a mortise cut in the base, and having one end threaded to correspond with the threaded end of the ram, and means whereby said block may be forced home at will against the threaded end of the ram, substantially as described.

7. In a rotatable tool holder for a shaper, the combination of a ram having a threaded extremity, a hollow base for a tool holder having a corresponding internal screw adapted to engage the threaded end of the ram and to rotate thereon, and a jamming block setting in a mortise cut in the base and having one end threaded to correspond with the threaded end of the ram, and means whereby said block may be forced home at will against the threaded end of the ram, a tool holder engaging the base and having a transverse motion to the axis of the ram, means for controlling the same, and adjustable side clamps adapted to grip the base and tool holder immovably together, substantially as described.

8. In a tool holder for a shaper, the combination of a base adapted to be secured to the ram, a transverse sliding block engaging said base and adapted to be adjustably secured thereto and having a threaded perforation, a tool holder adapted to engage rotatably therein, a threaded sliding gripping block in said block, the threaded end being adapted to engage the threaded tool holder, means for jamming said block against the tool holder, and adjustable means for carrying a tool therein, substantially as described.

9. In a reversing gear, the combination of the hollow driving shaft, a shifter bar operating clutches at either end thereof and extending through said hollow driving shaft, a clutch mounted on said shifter bar, a swinging arm pivoted at one end within a box support, having its free end adapted to engage said clutch, a friction roll mounted on said swinging arm, a rack having its under side formed into an irregular slot to engage with said friction roll, said rack adapted to slide longitudinally in bearings formed in said box support, and means for compelling the longitudinal movement of said rack, substantially as and for the purpose described.

In testimony whereof we sign this specification in the presence of two witnesses.

MATTHEW MORTON.
HENRY E. MORTON.

Witnesses:
F. W. BABCOCK,
E. P. GALE.