J. F. GAIL.

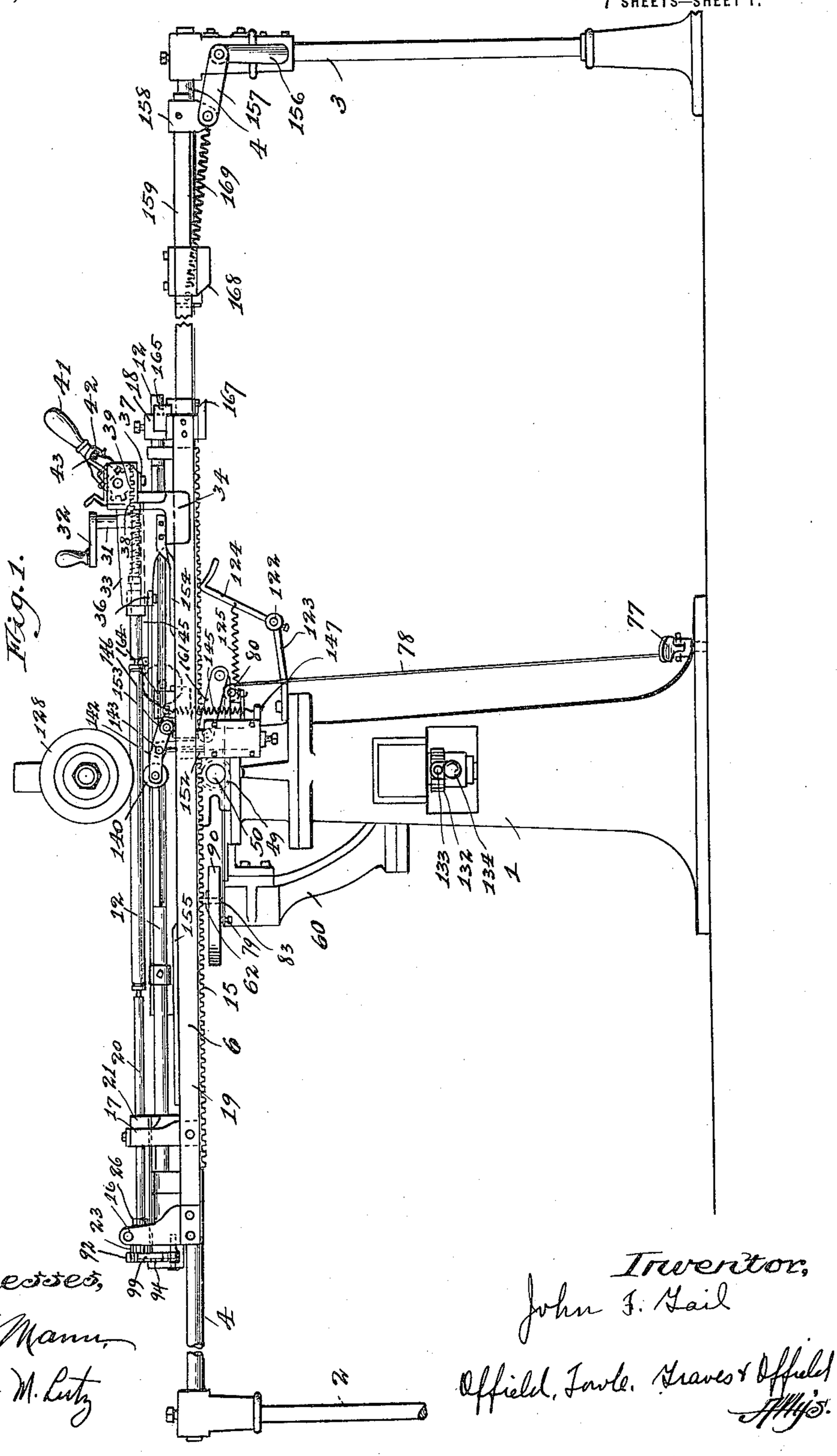
POLISHING MACHINE.

APPLICATION FILED FEB. 6, 1914.

1,154,696.

Patented Sept. 28, 1915.

7 SHEETS—SHEET 1.



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7 SHEETS—SHEET 2.

Fig. 2.

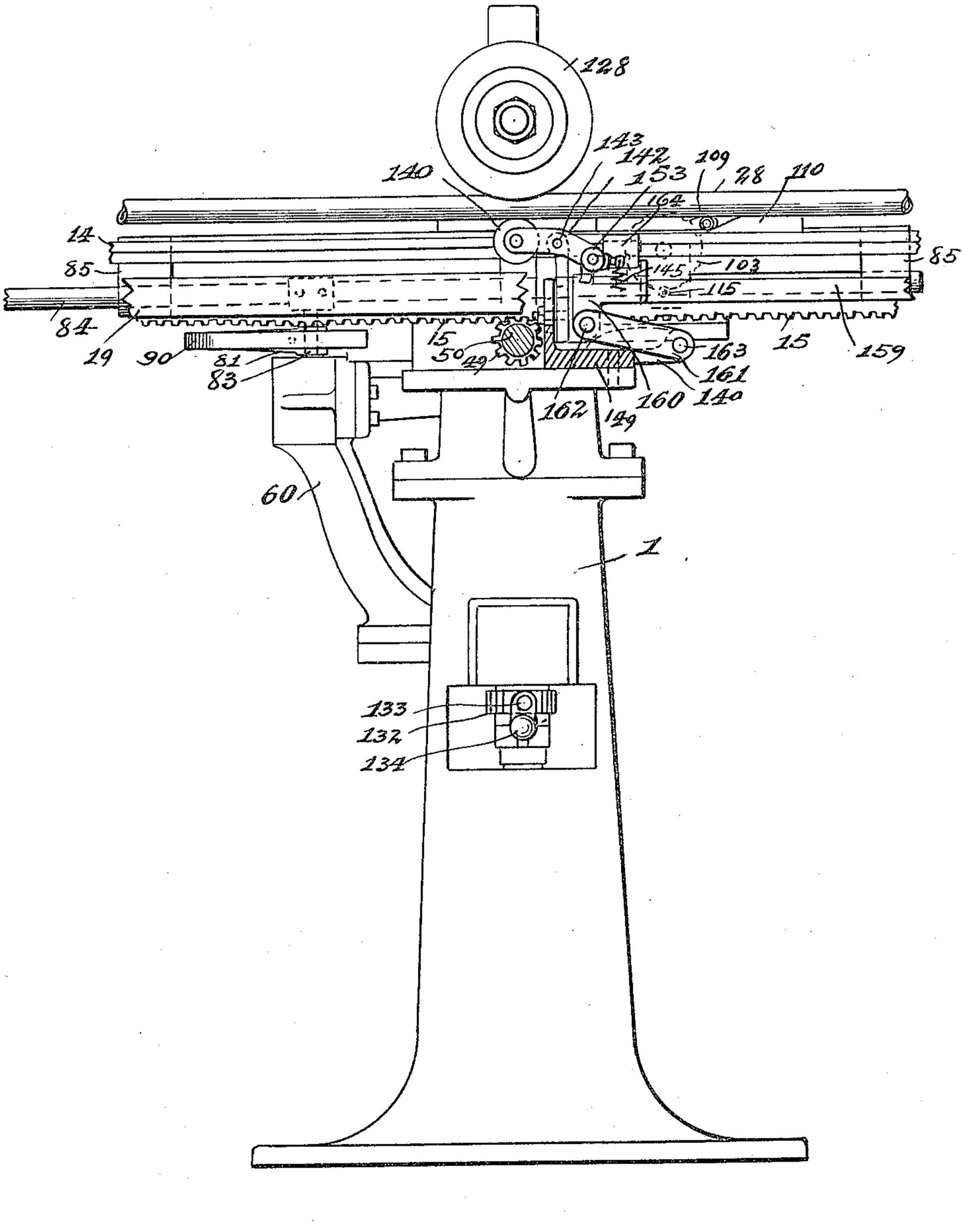

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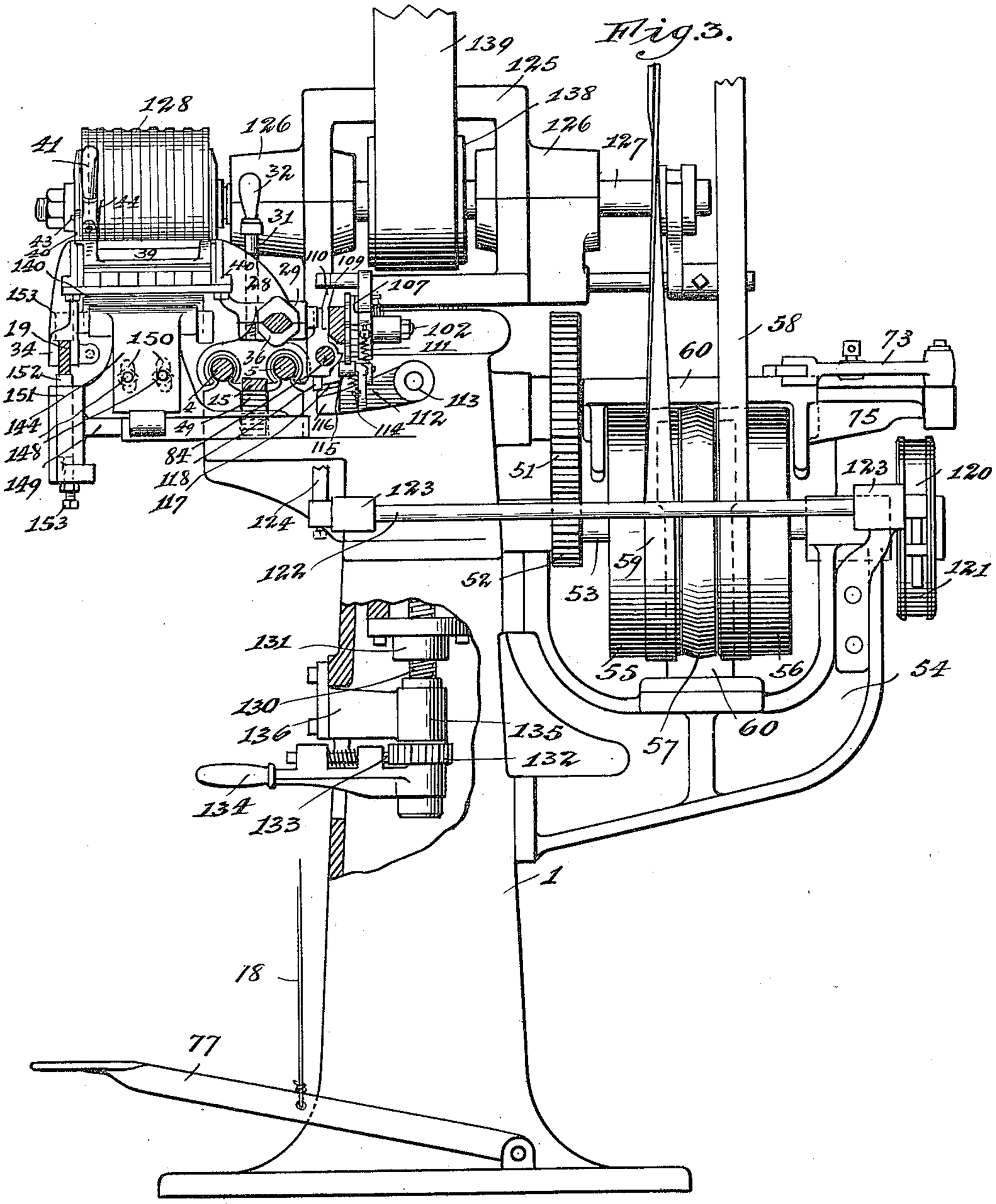
Fig. 3.



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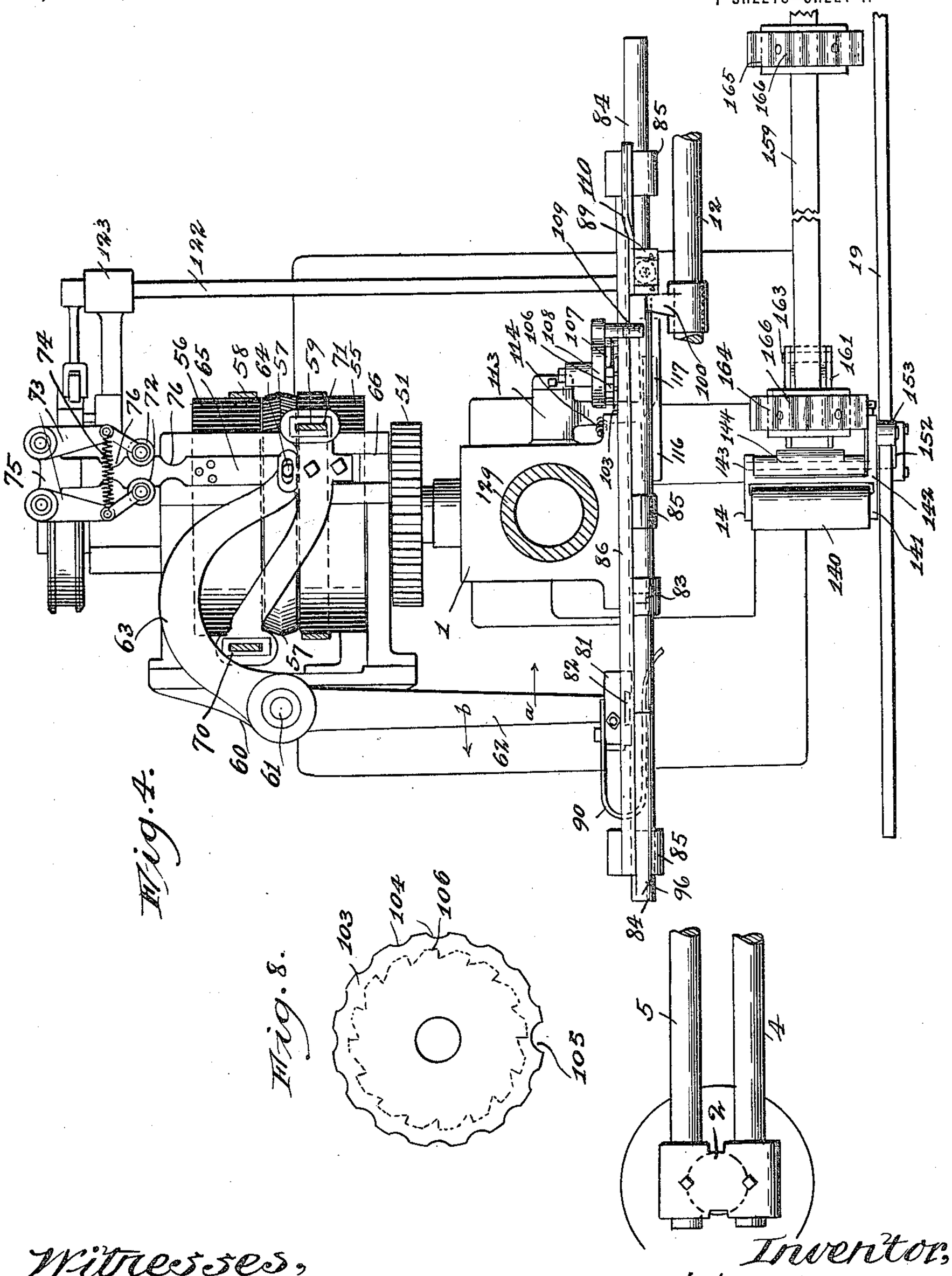

Fig. 4.

Fig. 8.

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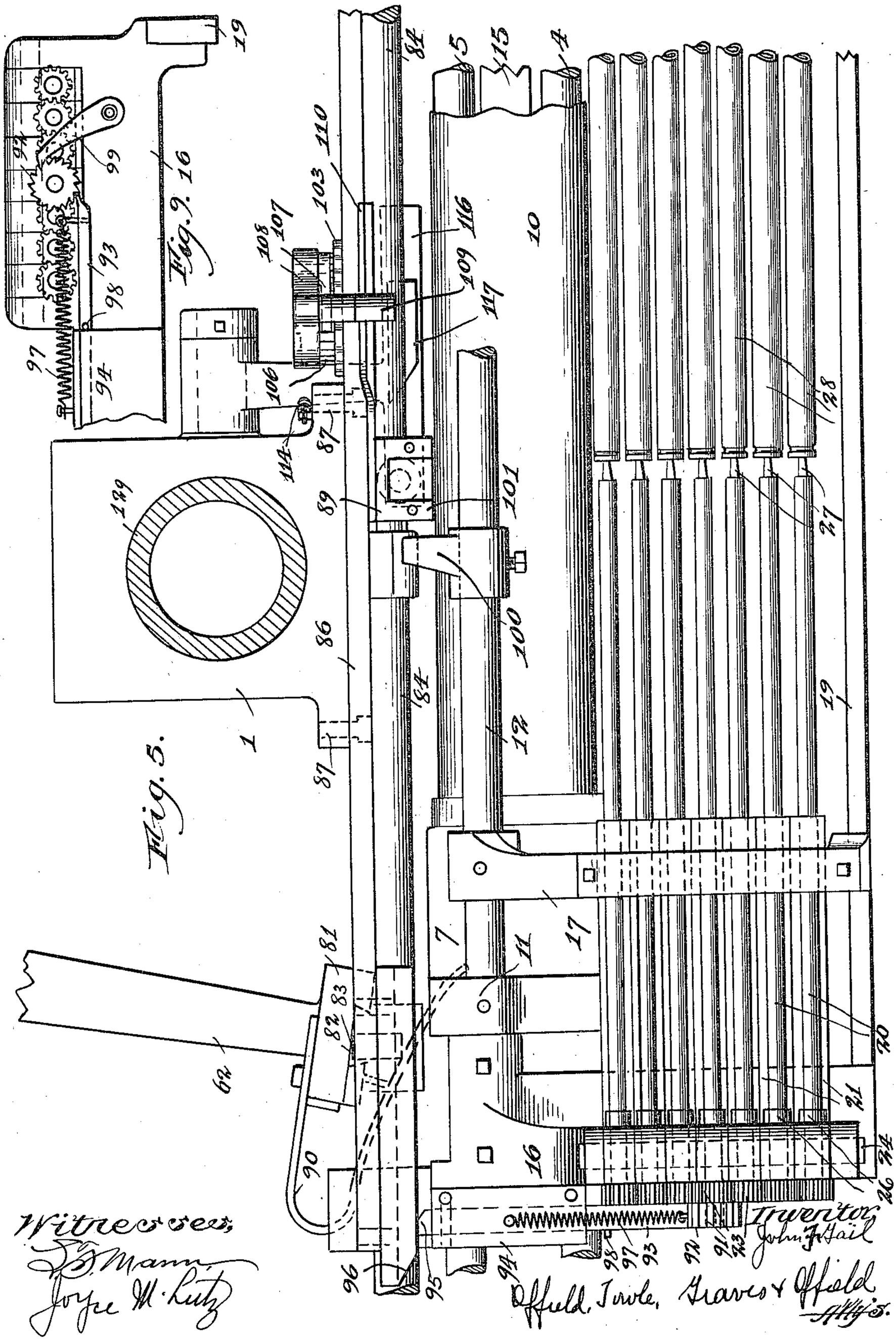

Fig. 5.

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7 SHEETS—SHEET 6.

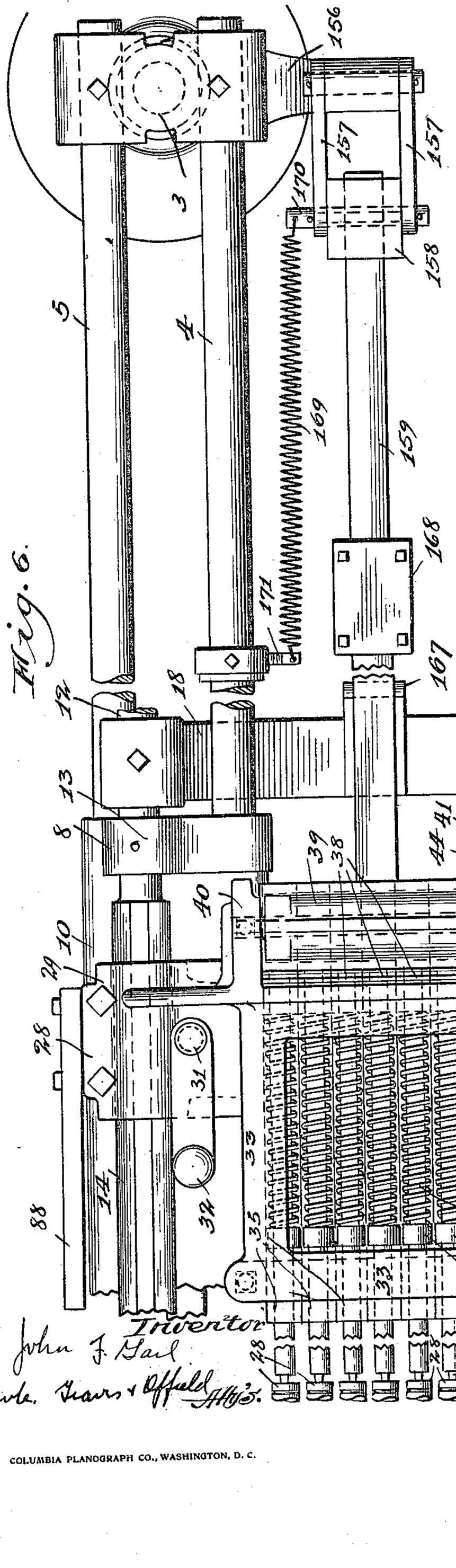

Fig. 6.

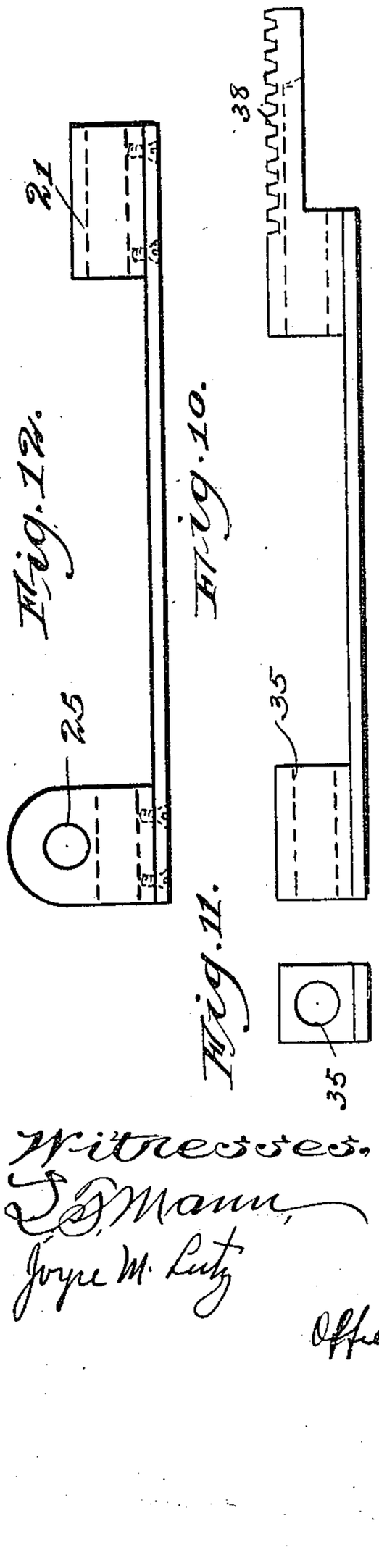

Fig. 12.

Fig. 10.

Fig. 11.

Witnesses.

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7 SHEETS—SHEET 7.

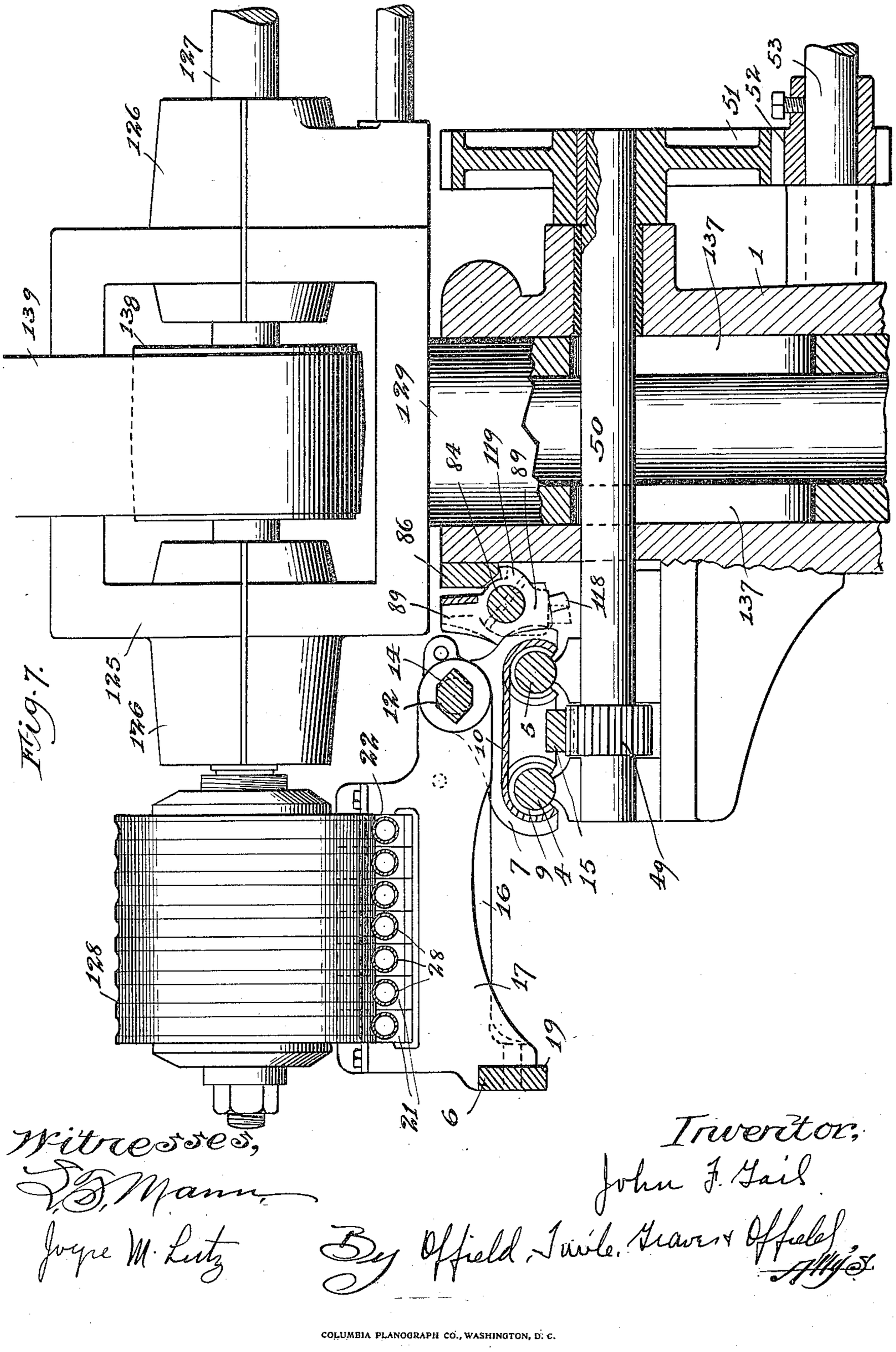

Fig. 7.

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UNITED STATES PATENT OFFICE.

JOHN F. GAIL, OF KENOSHA, WISCONSIN.

POLISHING-MACHINE.

1,154,696. Specification of Letters Patent. Patented Sept. 28, 1915.

Application filed February 6, 1914. Serial No. 816,937.

To all whom it may concern:

Be it known that I, JOHN F. GAIL, a citizen of the United States, residing in the city of Kenosha, county of Kenosha, and State of Wisconsin, have invented certain new and useful Improvements in Polishing-Machines, of which the following is a specification.

This invention relates to improvements in polishing machines and refers more particularly to a machine for polishing brass tubing, used in brass beds or other metal furniture and the like.

Among the salient objects of the invention are to provide a construction in which a series of tubes is simultaneously and automatically polished, the machine being so arranged as to insure a uniform polishing of the respective tubes; to provide a construction in which the tubes are mounted on a traveling carriage which is reciprocated back and forth beneath a revolving polishing wheel for a given number of reciprocations and in which the tubes are each partially turned on their axes during predetermined points in the travel of said carriage, the polishing wheel being rendered temporarily inoperative during said turning movement so as to prevent scratching of the surface of said tubes; to provide a construction in which the tubes are held on supporting saddles adapted to be raised and lowered to carry the tubes into position for mounting on the traveling carriage and for receiving the tubes from the carriage after the former have been polished, the operation of shifting the saddles into and out of position being entirely automatic and taking place at the end of the polishing operation; to provide a construction in which the tubes to be polished are independently mounted between spindles formed as part of the traveling carriage, the latter being provided with adjustable parts for accommodating various lengths and sizes of tubes; to provide a construction in which the tubes as they pass by the polishing wheel are held yieldably in engagement therewith by spring mounted bed-roller and in which both the polishing wheel and bed roller can be adjusted to accommodate tubes of various diameters; to provide in a construction of the character referred to novel mechanism for actuating the belt shifter to reverse the direction of the rotation of the traveling carriage, and which also serves as a step up counter mechanism for determining the number of reciprocations of said carriage; to provide means for automatically braking the carriage and associated parts at the termination of the polishing operation; to provide novel means for adjustably holding the tubes on the carriage spindles and under spring tension during the polishing operation and in which the whole series of tubes may be simultaneously locked into position or released from the spindles, and in general to provide an improved construction of the character referred to.

The invention consists in the matters hereinafter described and more particularly pointed out in the appended claims.

In the drawings—Figure 1 is a front side elevation of my improved polishing machine with parts broken out to reduce the size of the drawing and certain details being omitted for clearness of illustration; Fig. 2 is a view similar to Fig. 1 on an enlarged scale with the ends of the machine broken away and certain other parts shown in section in order to bring out various details of construction. Fig. 3 is an enlarged end elevation taken from the right hand end of Fig. 1 with parts broken away and shown in section to bring out the details of construction; Fig. 4 is a fragmentary top plan view of the central part of the machine taken below the polishing wheel, the support of the latter being shown in section and with certain details omitted for purpose of clearness; Figs. 5 and 6 taken together show a top plan view of the traveling carriage with parts broken out in order to reduce the size of the drawing; Fig. 7 is an enlarged fragmentary view taken centrally through the machine, substantially at right angles to Fig. 2, and showing more particularly the manner of adjustably mounting the polishing wheel, and also the driving mechanism for the traveling carriage; Fig. 8 is a detail view of the counter member which determines the number of reciprocations of the traveling carriage; Fig. 9 is a detail view showing the pawl and ratchet members which rotate the tubes on their axes; Fig. 10 is a side elevation of one of the spindle supports at the tail or rear end of the carriage; Fig. 11 is an end view of the same. Fig. 12 is a side elevation of one of the spindle supports at the front end of the carriage.

Referring to the drawings—1 designates

the main standard, 2 and 3 the end supports of the frame. On these standards are mounted a pair of parallel longitudinally extending track members 4 and 5, which take the form of round rods as shown more clearly in Fig. 7. Upon the track members is mounted a reciprocating carriage designated as a whole 6. This carriage comprises a pair of castings 7 and 8 having bearings 9 fitting over the rods 4 and 5. These castings 7 and 8 form the ends of the traveling carriage and are connected by a sheathing 10, suitably secured to the castings 7 and 8. The casting 7 is provided with an upstanding bracket 11 in which is rigidly mounted one end of a rod 12. The other end of said rod is fixed in a similar bracket 13 secured by the casting 8. The portion of the rod 12 adjacent the bracket 13 is rectangular in cross section as shown more clearly in Figs. 6 and 6, for a purpose hereinafter described. The lower ends of the castings 7 and 8 are recessed to receive a rack bar 15 which extends below and between the track members 4 and 5. To the front end of the rod 12 is bolted or otherwise secured a pair of cross frame members 16 and 17 which preferably take the form of castings as shown more clearly in Figs. 5 and 7. To the rear end of the rod 12 is fastened a cross frame member 18 which also takes the form of a casting and is connected to cross members 16 and 17 by a side bar 19.

Describing now the manner of mounting the tube spindles on the traveling carriage, the frame members 16 and 17 together serve as a head stock to support the front tube spindles 20, 20. These spindles 20 are mounted in holders 21 (see Fig. 12) which holders are seated in suitable recesses or cut away portion 22, 22 formed in the cross frame members 16 and 17. These holders 21 are detachably mounted in the frame members 16 and 17 in order that the holders and spindles may be removed so that spindles of different sizes may be substituted if desired. To this end a pin 24 extends through suitable apertures 25 in the head ends of the holders 21. The front end of each spindle 20 is provided with a spur gear 23, 23 which meshes with each other as shown more clearly in Fig. 5. The forward movement of the spindle through the holders 21 is limited by collars 26 mounted on the spindles. The rear end of each spindle is provided with a prong 27 adapted to hold one end of the tubes 28 which are to be buffed or polished.

Referring now to the rear end of the carriage, on the flattened portion 14 of the rod 12 is secured a clamping member designated as a whole 28 comprising upper and lower portions 29 and 30, which fit around the member 14 and are locked thereto by means of a threaded bolt 31 which is manually operated by a crank arm 32. The arrangement is such that by loosening the threaded bolt the clamp may be adjusted lengthwise on the rod 14. The clamping member 28 forms a part of a skeleton casting 33 which serves as a tail stock for the spindles. The opposite side of the tail stock 33 is provided with a shoe 34 which rides on the side bar 19. In the head stock is mounted a plurality of tube holders 35, seven in the present instance, which are held at the front end by supporting plate 36 and at their rear ends by cross plate 37. The rear end of each holder 35 is provided with a short rack member 38. These rack members 38 are moved together by means of a gear segment 39 which extends entirely across the face of the racks, and is pivotally mounted in ears 40 forming extensions of the tail stock casting. The gear segment is operated by means of a handle 41. This handle is fixed to the gear segment so that it will rotate the latter but has limited lateral movement in order that it may be swung clear of a latch member 42 which is engaged by a pin 43 on the handle. The pin 43 is normally held into the latch 42 by means of a spring 44. By the arrangement just described, it will be seen that by operating the handle 41 the holders 35 can be moved back and forth for a limited distance in the tail stock. In the holders 35 are mounted the rear tube spindles 45, 45. The front ends of these spindles are provided with prongs 46 for holding the rear ends of the tubes to be polished. On each of these spindles is mounted a coiled expansion spring 47, the rear ends of which abut against the holders 35, and the front ends of which abut against collars 48 carried by the spindles 45. These springs normally tend to force the spindles forwardly. The spring tension on the tube spindles may be increased or lessened by shifting the holders 35 through the action of the rack bar 38, segmental gear 39 and handle 41. The tubes are locked in position on the spindles simply by operating the handle 41 which actuates the rack bar 38.

Describing now the manner of reciprocating the traveling carriage, the rack bar 15 is actuated by means of a spur pinion 49 carried by a short shaft 50 journaled in suitable bearings in the main standard 1. The rear end of the shaft 50 carries a spur gear 51 which meshes with a similar gear 52 on the belt pulley shaft 53. The shaft 53 is mounted in a forked bracket 54 carried by main standard 1. On the shaft 53 is mounted two idler pulleys 55 and 56 respectively, and a driving pulley 57. On these pulleys are mounted driving belts 58 and 59 which drive in opposite directions, the belt 59 serves to rotate the shaft in a direction to move the carriage forwardly, while the

other belt serves to drive the shaft in the opposite direction to reciprocate the carriage rearwardly.

The machine is so arranged that the belts are shifted alternatively from their respective loose pulley to the driving pulley at the end of the travel of the carriage in either direction. To this end, the bracket 54 is provided with an extension 60 on which is pivoted as shown at 61 a belt shifter arm 62, one end of which terminates in a curved extension 63. This member 63 is pivoted as shown at 64 to a plate 65 which slides in a grooved guide way 66 carried by the bracket 60. To the plate 65 is rigidly connected a belt gripper member 67 which takes the form of a bent plate or arm provided with apertures 70 and 71 to receive the respective belts. The plate 65 is held yieldably in whatever position it is left by the shifter member by means of a pair of rollers 72 mounted in pivoted arms 73, which are held together by coiled spring 74. The arms 73 are pivoted to an extension 75 of the bracket member 60. The rollers 72 are adapted to engage notches 76 formed in plate 65 in an obvious manner.

Describing now the manner of actuating the belt shifter arm 62, to the base of the main standard 1 is pivoted a foot lever 77 connecting to an operating cable 78, one end of which is connected at 79 to the forward end of the arm 62. The cable 78 passes over an anti-friction pulley 80 grooved in the standard 1 as shown in Fig. 1. The actuation of this lever pulls the arm 62 in the direction indicated by the arrow *a* (Fig. 4). This shifter belt 59 then moves the belt over the drive pulley. The end of the lever 62 is provided with a head portion 81 having a recessed portion 82. As the lever 62 is swung in the direction of the arrow *a*, heretofore described, the recessed portion engages a pin or stud 83 carried by a reciprocatory rod 84 which reciprocates in bearings 85 carried by plate 86 rigidly secured as shown at 87 to the standard 1. As heretofore stated, the arm 62 has now been shifted so that the belt 59 engages the drive pulley 57. The carriage is now traveling forwardly. On the tail stock of the carriage is mounted a finger 88 which is adapted to engage a block 89, carried by the rod 84. When the finger 88 engages this stop or block 89, it carries the rod 84 forwardly in its bearings. The arm 62 being connected to the finger 83 swings the arm 62 in the direction of the arrow *b* (Fig. 4), shifts the belt 59 back on its loose pulley and at the same time carries the belt 58 onto the drive pulley. This reverses the direction of travel of the rack bar and the carriage starts rearwardly. It will be understood that the parts just described are so arranged that this belt shifting will not take place until the carriage has reached the end of its forward movement of travel. The pin 83 is held in the recess 82 of the head 81 by a bow-spring 90. This spring 90 also serves to rock the arm 84 which is loosely mounted in bearings 85 for a purpose hereinafter described. The rack bar 15 is now traveling rearwardly for the reason that the belt 58 is now riding on the drive pulley 57.

As the carriage travels rearwardly, means are provided for partially turning the tube spindles and associated tubes on their axes. It will be remembered that the tube spindles 20 are provided with intermeshing gears 23. One of these tube spindles is provided with an extension 91 on which is mounted a ratchet wheel 92. Coöperating with this ratchet wheel is a pawl member 93 slidably mounted as shown at 94 in the head stock. The pawl is provided with a cam extension 95 which is adapted to be engaged by cam member 96 carried by the plate 86 which is rigid with the standard 1 as heretofore described. The pawl is normally held in retracted position by spring 97 and is limited in its movement by a stop 98. The ratchet wheel 92 is provided with a stop-dog 99. As the traveling carriage moves rearwardly, the cam member 96 engages the cam 95 and forces the pawl 93 outwardly to step up the ratchet wheel one step. This movement is communicated through the train of gears to the various spindles thereby partially turning the tubes. It will be understood that this turning of the spindle is automatically accomplished on each rearward reciprocation of the traveling carriage. The parts just described are so timed that the tubes will be turned so that all parts of the surface thereof will be uniformly polished or buffed.

As the carriage approaches the limit of its rearward travel, means are provided for automatically reversing the belts on the drive pulley. On the rod 12 of the traveling carriage is mounted a finger 100 which engages an extension 101 on the block 89, carried by and rigid with the reciprocating rod 84. This causes the rod 84 to move rearwardly, swinging the belt shifter arm 62 as heretofore described. This reverses the belts on the driving pulleys and the carriage again starts forwardly.

As heretofore stated, means are provided for automatically stopping the machine after a predetermined number of reciprocations of the traveling carriage. This consists in an automatic timing mechanism mounted on a stud 102, on the plate 86 is a selector wheel 103 having in its periphery a series of circumferential notches 104 of uniform depth and a single deep notch or groove 105 as shown more clearly in Fig. 8. The number of notches may be varied as desired. Rigid with the selector

wheel 103 is a ratchet wheel 106. The ratchet wheel is stepped up by means of a pawl 107. This pawl 107 is carried by a disk 108 mounted on the stud 102. On the disk 108 is an overhanging finger 109 which extends across the plate 86 into the path of a cam plate 110 secured to the shifting rod 84. This finger 109 is normally held in engagement with the face of the plate 86 by means of a spring 111 secured at one end to the disk and at the other to a latch member 112. The latch member 112 is pivoted as shown at 113 to the standard 1 and is normally held up by spring 114 secured at one end to the latch and at the other to the standard 1. On this latch is a roller 115 which sits in the notches 104 and 105 and yieldably holds the selector wheel in the position to which it has been stepped by the pawl 107 and ratchet wheel 106. It will be understood from the foregoing description that on each forward reciprocation of the carriage the cam member 110 will engage the overhanging finger 109, rock the disk 108 thus causing the pawl 107 to step the ratchet wheel and associate selector wheel up one step. It may be here noted that the tubes are so turned relative to the number of reciprocations of the carriage that each portion of the tube will obtain the same polish, for example, if the carriage reciprocates sixteen times, the tubes might be turned one-eighth or one-quarter of a turn at each reciprocation.

When the selector wheel has been turned so that the roller 115 engages the deep notch 105, the carriage is stopped. As the roller 115 remains in the deep notch it permits the latch member 112 to move upwardly through the action of the coiled spring 114. On the outer end of the latch 112 is a T-shaped head 116 which lies below the rod 84. On the upper face of the head 116 is a cam block 117 which as the latch 112 moves upwardly is brought into the path of the finger 118 carried by the block 89. Normally the spring 90 acts on the finger 83 to hold it in the notch 82 as heretofore described, and at the same time rocks and holds the rod 84 into the position shown in full line in Fig. 7. The block 89 is provided with a shoulder 119 which abuts against the lower face of the plate 86. As the rod 84 is reciprocated rearwardly, by the action of the finger 100 mounted on the rod 12 as heretofore described, the pin 118 will engage the cam 117 and thus rock the rod 84 to the position shown in dotted lines in Fig. 7. This swings the finger 83 out of the recess 82 on the head of the shifter arm 62 and leaves the belts on the loose pulleys. It is to be understood that the arm 84 will be rocked so as to release the belt shifter arm 62 only when the cam on the latch 112 is raised up in the path of the pin 118 as heretofore described. Accordingly, while the roller 115 is riding in the shallow notches of the selector wheel, the cam lies in a plane below the path of the pin 118, and the connection of the belt shifter arm to the rod is not effected. When the roller reaches the deep notch 105, the belts shift to the idler pulleys and the machine of course stops.

When the belts are shifted to the idler pulleys, mechanism is provided for automatically braking the machine against further movement. On the shaft 53 is mounted a band-brake 120, of well known construction. The band 121 is connected to a rock shaft 122 mounted in suitable bearings 123 on the main frame. To one end of this rock shaft 122 is connected an arm 124 normally held back by a spring 125. This arm 124 is actuated by the block 89 on the rod 84 as follows—while the machine is running, the parts are so arranged that on the reciprocation of the rod 84, it does not travel far enough rearwardly to reach the arm 124 of the braking mechanism. When the belts, however, are shifted to the loose pulleys and the shifting mechanism disconnected from the rod 84 heretofore described, the momentum of the machine is sufficient to carry the rod 84 rearwardly, so that the block 89 actuates the arm 124 and thus tightens the brake-band and automatically brakes the machine.

Describing now the polishing mechanism, in a frame head 125′ provided with bearings 126 is mounted a drive shaft 127, on one end of which is secured a polishing wheel 128. The frame head 125′ is carried by a post 129 which is adjustably mounted in the main standard 1. The lower end of this post 129 is provided with a screw-threaded extension 130 which is threaded through a nut 131 rigidly supported inside the standard 1 as shown clearly in Fig. 3. The screw 130 carries a ratchet wheel 132 which is actuated by spring dog 133 carried by a handle 134. The screw 130 projects through a bearing 135 carried by bracket 136 supported from the main frame. The post 129 is slotted as shown at 137 in order that the post may be raised and lowered without affecting the drive shaft 50. The wheel shaft 127 is provided with a pulley 138 and a drive belt 139 connected to any suitable source of power.

As heretofore stated, a bed roller is provided for yieldably holding the tubes in engagement with the polishing wheel. This roller 140 is journaled in arms 141 of a frame 142. The frame 142 is pivoted as shown at 143 to an adjustable plate or bracket 144. The roller 140 is normally held up in engagement with the under-sides of the tubes by means of a spring 145 fastened at 146 to the rear end of the pivoted frame,

and at 147 to the standard 1. The plate or bracket 144 is bolted as shown at 148 to a stationary casting 149 connected to the stationary standard 1. The plate 144 is provided with slots 150 whereby it may be adjusted on bolts 148. The purpose of adjusting this plate is to set the rollers for tubes of different size.

In order to support the traveling carriage at the point where the tubes pass between the polishing wheel and bed roller, on the casting 149 is a socket member 151, in which is mounted a bed block 152. This bed block is adjusted by means of a screw 153 and serves as a support for the side bar 19 of the traveling carriage. In order to release the pressure of the bed roller on the underside of the tube at the end of the travel of the tubes in either direction during the reciprocation of the carriage, on the rear end of the pivoted frame 142 is a cam roller 153. When the carriage approaches the limit of its travel of forward movement it rides upon a cam 154 secured on the tail stock of the carriage. This rocks the pivoted frame 142 of the mechanism which carries the roller out of engagement with the tubes. The same result is obtained when the carriage approaches its rearward limit of travel, the roller then riding up on a cam 155 mounted on the side bar 19 of the carriage. It should be here noted that the numbers 21 and 35 have a certain amount of vertical play in their respective holders so that when the bed roller pressure is removed from the under surface of the tubes, the latter may drop out of contact with the polishing wheel.

Describing now the mechanism for receiving the tubes after they have been polished, to a bracket 156 on the base 3 is pivoted a pair of links 157. The front end of these links 157 is pivoted to a block 158 carrying a bar 159. The front end of this bar 159 is secured to a casting or head 160 supported by links 161 pivoted as shown at 162 to the casting or head 160, and at 163 to the bracket 149. On the bar 159 is adjustably mounted a pair of saddles 164 and 165, which saddles are grooved as shown at 166 to receive the tubes. As the carriage approaches its rearward limit of travel on the last reciprocation, a cam 167 carried by the end member 18 of the traveling carriage engages a cam block 168 mounted on the bar 159 and lifts the bar so as to bring the saddles up to the tubes. The tubes are now released from the spindle in the manner heretofore described, whereupon they rest on the saddles. They may now be removed by hand and a new set placed in the saddles and locked on the spindles. When the machine starts, the cam 167 rides out of engagement with the cam block 168 whereupon the saddles and bar 159 drop by gravity below the tubes. In order to insure of the saddles moving away from the tubes, a spring 169 is secured at one end as shown at 170 to the link 157 and at its other end at 171 to the track 4 which spring tends to pull the bar downwardly.

The invention is not limited to the details of construction shown, except as set forth in the appended claims.

I claim as my invention:—

1. In a polishing machine, the combination with a main frame, of a reciprocatory carriage mounted thereon, a work support carried by said carriage, a polishing wheel, a bed roller for holding the work in engagement with said polishing wheel and means for actuating said parts.

2. In a polishing machine, the combination with a main frame, of a reciprocatory carriage mounted thereon, a plurality of work supports carried by said carriage, a polishing wheel, a spring actuated bed roller for holding the work yieldably in engagement with said polishing wheel and means for actuating said parts.

3. In a polishing machine, the combination with a main frame, of a reciprocatory carriage mounted thereon, a plurality of work supporting spindles carried by said carriage, a polishing wheel, a bed roller for holding the work yieldably in engagement with said polishing wheel, means for partially turning the spindles at predetermined intervals in the travel of the carriage and means for actuating said various parts.

4. In a polishing machine, the combination of a main frame, a reciprocatory carriage mounted thereon, a series of work supports on said carriage for holding contemporaneously a plurality of objects to be polished, a polishing member, means for holding the objects in engagement with said polishing member, automatic means for reciprocating said carriage and automatic means for rotating said objects.

5. In a polishing machine, the combination with a main frame, of a traveling carriage mounted thereon, pinion and rack mechanisms for operating said carriage, a series of adjustably mounted work supporting members on said carriage for holding a plurality of objects to be polished, a polishing wheel mounted above said carriage, means for holding the objects in engagement with said wheel as they pass by the latter, and means for turning said objects at predetermined intervals in the travel of said carriage.

6. In a polishing machine, the combination with a main frame, of a reciprocatory carriage mounted thereon, a plurality of work supporting spindles carried by said carriage for holding the objects to be polished, a polishing wheel, means for holding the objects in engagement with said polishing wheel, means for intermittently rotating the objects at predetermined intervals in

the travel of the carriage, and means for rendering the polishing wheel inoperative upon said objects during said rotation of the objects.

7. In a polishing machine, the combination with a main frame, of a reciprocatory carriage mounted thereon, a plurality of work supporting members carried by said carriage for holding the objects to be polished, a polishing wheel, a spring actuated bed roller for holding the objects yieldably carriage mounted thereon, a polishing wheel, means for intermittently rotating the work and means for rendering the polishing wheel inoperative on said objects during said rotation.

8. In a polishing machine, the combination with a main frame, of a reciprocatory carriage mounted thereon, a polishing wheel, a work supporting member carried by said carriage for holding the objects to be polished, said work supporting member having vertical play on said carriage, means for pressing the object in engagement with said polishing wheel, and means for rendering said pressing means temporarily inoperative to allow the object to be removed from engagement with said polishing wheel at predetermined intervals.

9. In a polishing machine, the combination of a main frame, a reciprocatory carriage mounted thereon comprising a pair of stock members, one of said stock members being adjustably mounted on said carriage, a plurality of pairs of members carried by said stock members for supporting contemporaneously a plurality of objects to be operated upon, a polishing wheel adapted to engage the work during the travel of the carriage, and means for actuating said polishing wheel and carriage.

10. In a polishing machine, the combination with a main frame, of a traveling carriage mounted therein comprising a pair of stock members, one of said stock members being adjustably mounted on said carriage, a plurality of work supporting spindles carried by each of said stock members for holding a plurality of objects to be polished contemporaneously, a polishing member adapted to engage the objects during their travel with the carriage, and means for turning the objects on said spindles.

11. In a polishing machine, the combination with a main frame, of a reciprocatory carrier mounted therein and having a plurality of work supporting members for holding contemporaneously a plurality of objects to be polished, shifting mechanism for automatically reversing the direction of travel of the carrier, means for automatically stopping said carrier after a predetermined number of reciprocations thereof, a polishing wheel adapted to engage the objects while traveling with said carrier, means for simultaneously turning the objects and means for actuating said various parts.

12. In a polishing machine, the combination with a main frame, of a traveling carriage mounted thereon, pinion and rack mechanism for reciprocating said carriage, a support on said carriage for holding the object to be polished and brake applying means for automatically stopping said carriage after a predetermined number of reciprocations thereof.

13. In a polishing machine, the combination with a main frame, of a traveling carriage mounted thereon, pinion and rack mechanism for reciprocating said carriage back and forth, switch mechanism operated by the reciprocations of said carriage for changing the direction of travel of said carriage, means for removing the power applied to said pinion and rack mechanism after a predetermined number of reciprocations of said carriage and brake applying means for preventing motion of said carriage after the power has been removed from said reciprocating mechanism.

14. In a polishing machine, the combination with a main frame, of a reciprocatory carriage mounted thereon, means for reciprocating said carriage a predetermined number of times, a polishing wheel, a work supporting member on said carriage for holding the object to be polished, means for effecting engagement between the object and said polishing wheel and means for extending the travel of said carriage in one direction after said predetermined number of reciprocations thereof.

15. In a polishing machine, the combination with a main frame, of a carrier mounted thereon having a plurality of supporting members for holding the objects to be polished, a polishing wheel, means for holding the objects in operative engagement with said polishing wheel, means for reciprocating said carriage between given limits of motion, means for automatically stopping said carriage after a predetermined number of reciprocations thereof, and means for permitting said carriage to over-run one of said limits in one direction after the stopping thereof.

16. In a polishing machine, the combination with a main frame, of a carrier mounted thereon and having a series of supporting members thereon for holding simultaneously a plurality of objects to be polished, and a supporting saddle for receiving simultaneously said plurality of objects and placing them in position to be secured in said supporting members.

17. In a polishing machine, the combination with a main frame, of a reciprocatory carrier mounted thereon and having a plurality of supports thereon for holding the

objects to be polished, a polishing wheel, means for effecting operative engagement between the objects and said polishing wheel, a supporting saddle for facilitating the application of said objects to the supporting members prior to the polishing operation, means for automatically stopping the polishing operation, after a predetermined number of intervals and means for placing said supporting saddle in operative relation at the end of said polishing operation.

18. In a polishing machine the combination of a main frame, a reciprocatory carriage mounted thereon, a series of pairs of work supports for contemporaneously holding a plurality of objects to be polished and carried by said carriage, a polishing wheel, a spring-actuated bed roller for holding the work in engagement with said polishing wheel, means for reciprocating said carriage a predetermined number of times and then arresting said reciprocations, a normally inoperative supporting saddle for facilitating the application of the work to said supports, and means for placing said saddle in operative position after the arrest of said reciprocations.

19. In a machine of the character described the combination with a plurality of chucks, a movable saddle provided with suitable seats for the objects to be worked, means for moving said saddle into position to facilitate the application of the object to the chucks and means for returning said saddle to its normal position at the commencement of the working operation.

20. In a polishing machine, the combination of a series of chucks, a movable saddle with a series of suitable seats for a series of objects to be polished contemporaneously, means for moving said saddle into position to facilitate the application of the chucks and means for simultaneously engaging said objects with the chucks when the saddle is in such position.

21. In a polishing machine, the combination of a plurality of chucks, a movable saddle with suitable seats for the objects to be polished, means for moving said saddle into position to facilitate the application of the chucks, means for simultaneously engaging said objects with the chucks when the saddle is in such position and automatic means for returning said saddle to normal.

22. In a machine of the class described, the combination of a series of work-supporting spindles, a movable saddle provided with suitable seats for supporting the objects to be operated upon for facilitating the application of said objects to the spindles, automatic means for shifting said saddle at the end of a working operation on said objects into position to facilitate the application of the objects to the spindles, and means for simultaneously securing said objects to the spindles when the saddle is in such position, said saddle being adapted to return automatically to its normal position at the commencement of the working operation.

23. In a machine of the class described, the combination of a polishing wheel, a traveling carriage provided with a head stock member and a tail stock member, a plurality of work supports on each of said stocks, the supports on one end of said stocks being provided with spring engaging means for holding the objects to be worked and means for simultaneously disengaging said work supports.

24. In a machine of the class described, the combination of a polishing member, a carrier provided with a head stock member and a tail stock member for holding contemporaneously a series of pairs of supports for holding a plurality of objects to be operated upon simultaneously by said polishing member, individual supports for each of the objects on each of said stocks, the supports on one of said stocks being provided with spring-actuating means for holding the objects, and means for simultaneously engaging said work supports.

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Witnesses:
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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

Correction in Letters Patent No. 1,154,696.

It is hereby certified that in Letters Patent No. 1,154,696, granted September 28, 1915, upon the application of John F. Gail, of Kenosha, Wisconsin, for an improvement in "Polishing-Machines," an error appears in the printed specification requiring correction as follows: Page 6, line 12, claim 7, strike out the words and comma "carriage mounted thereon, a" and insert the words *in engagement with said;* and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 29th day of August, A. D., 1916.

[SEAL.]

F. W. H. CLAY,

Acting Commissioner of Patents.

Cl. 51—4.