928,253.

J. F. GAIL.

BUFFING MECHANISM.

APPLICATION FILED JULY 27, 1908.

Patented July 20, 1909.

8 SHEETS—SHEET 1.

Fig. 1.

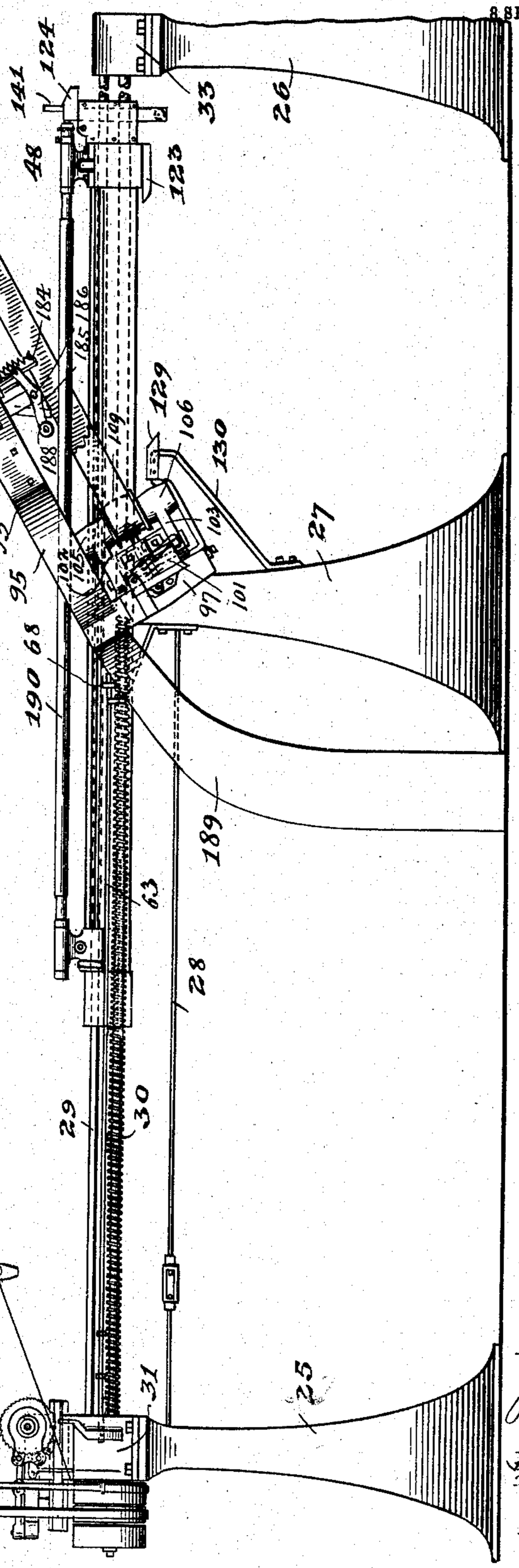
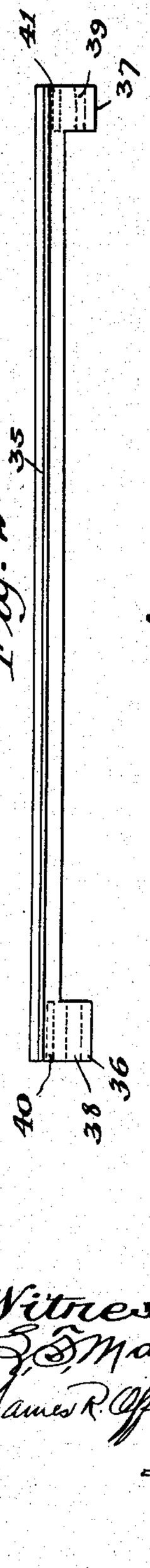


Fig. 2.



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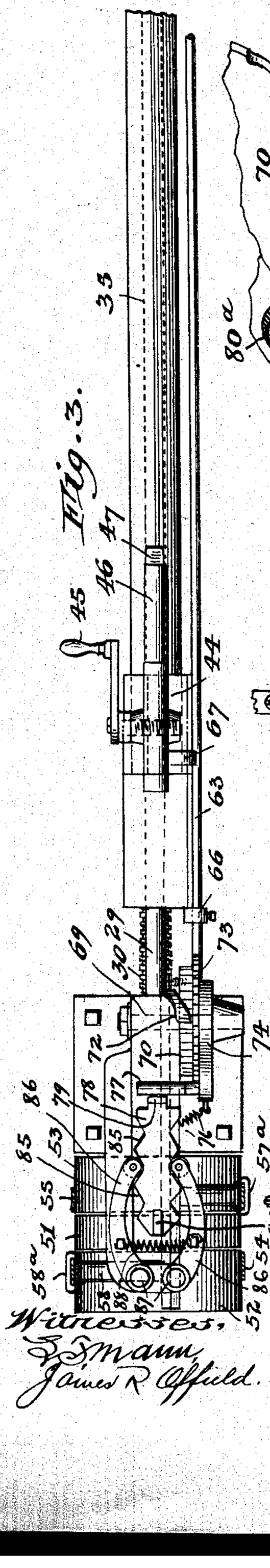

Fig. 3.

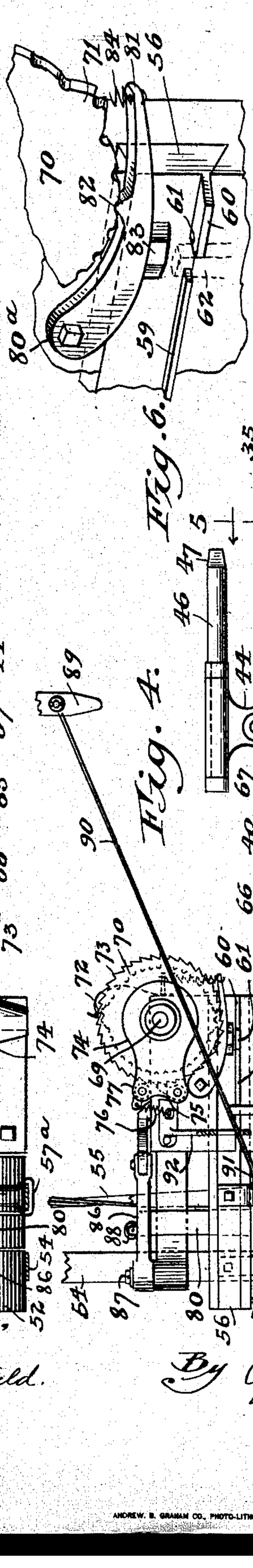

Fig. 6.

Fig. 4.

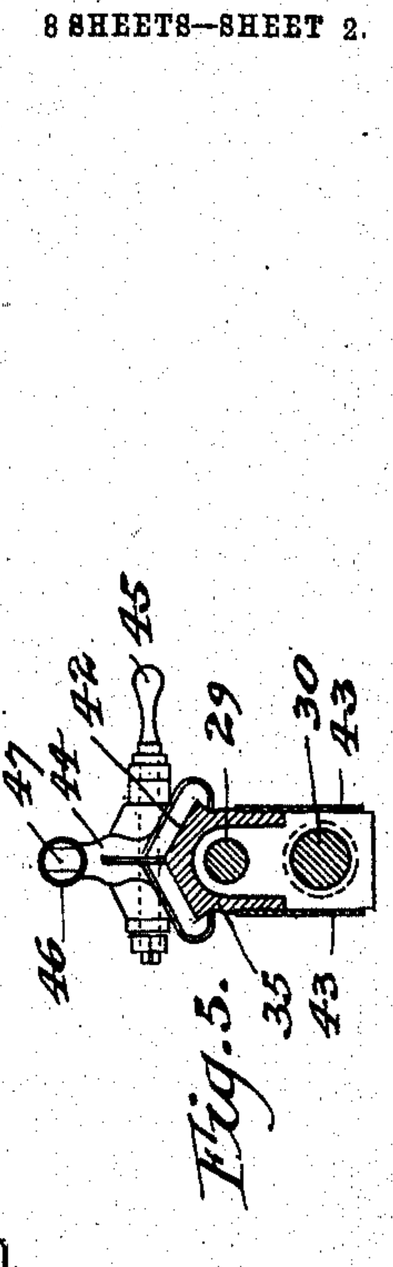

Fig. 5.

Witnesses,
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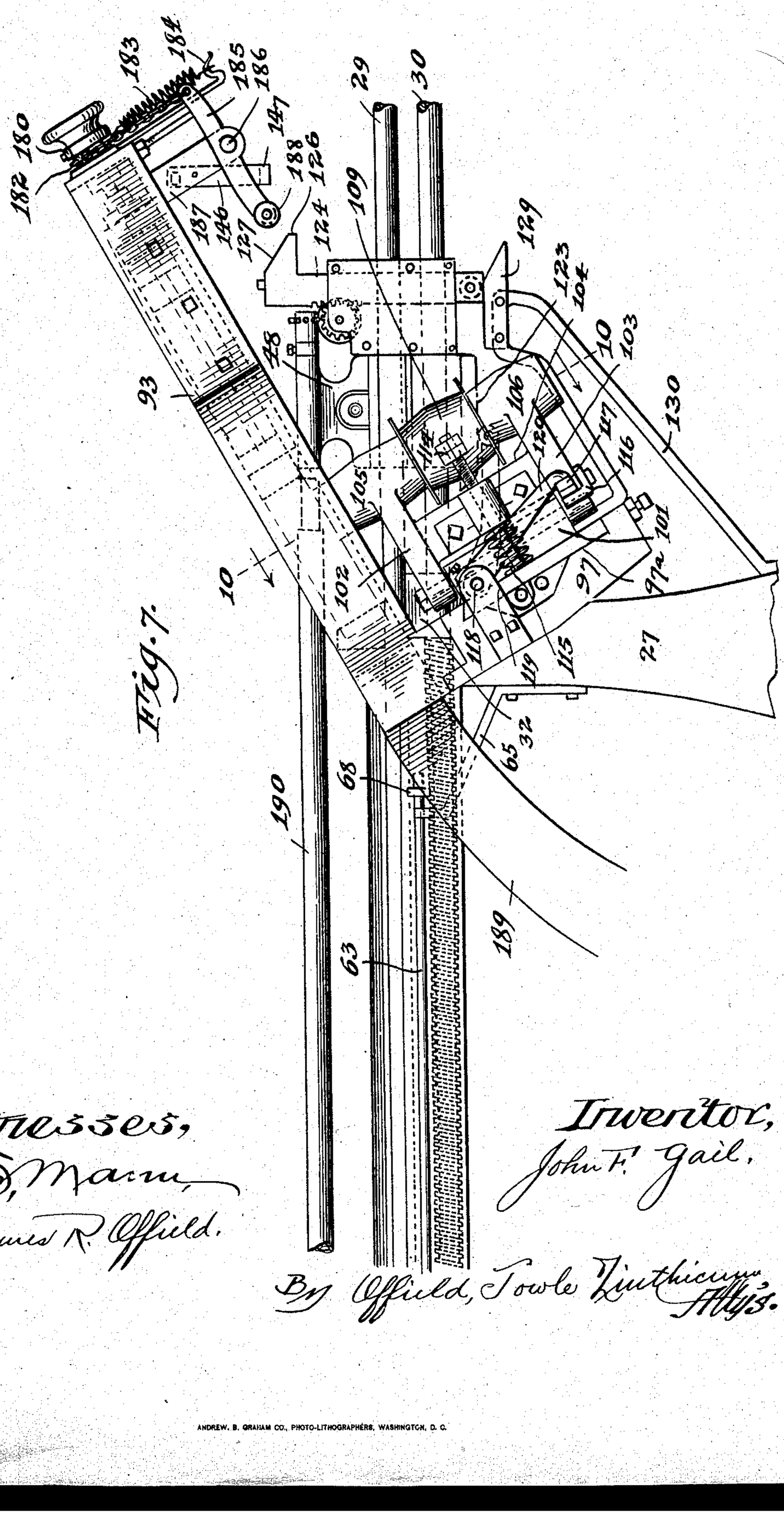

Fig. 7.

Witnesses,
F. F. Mann,
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8 SHEETS—SHEET 4.

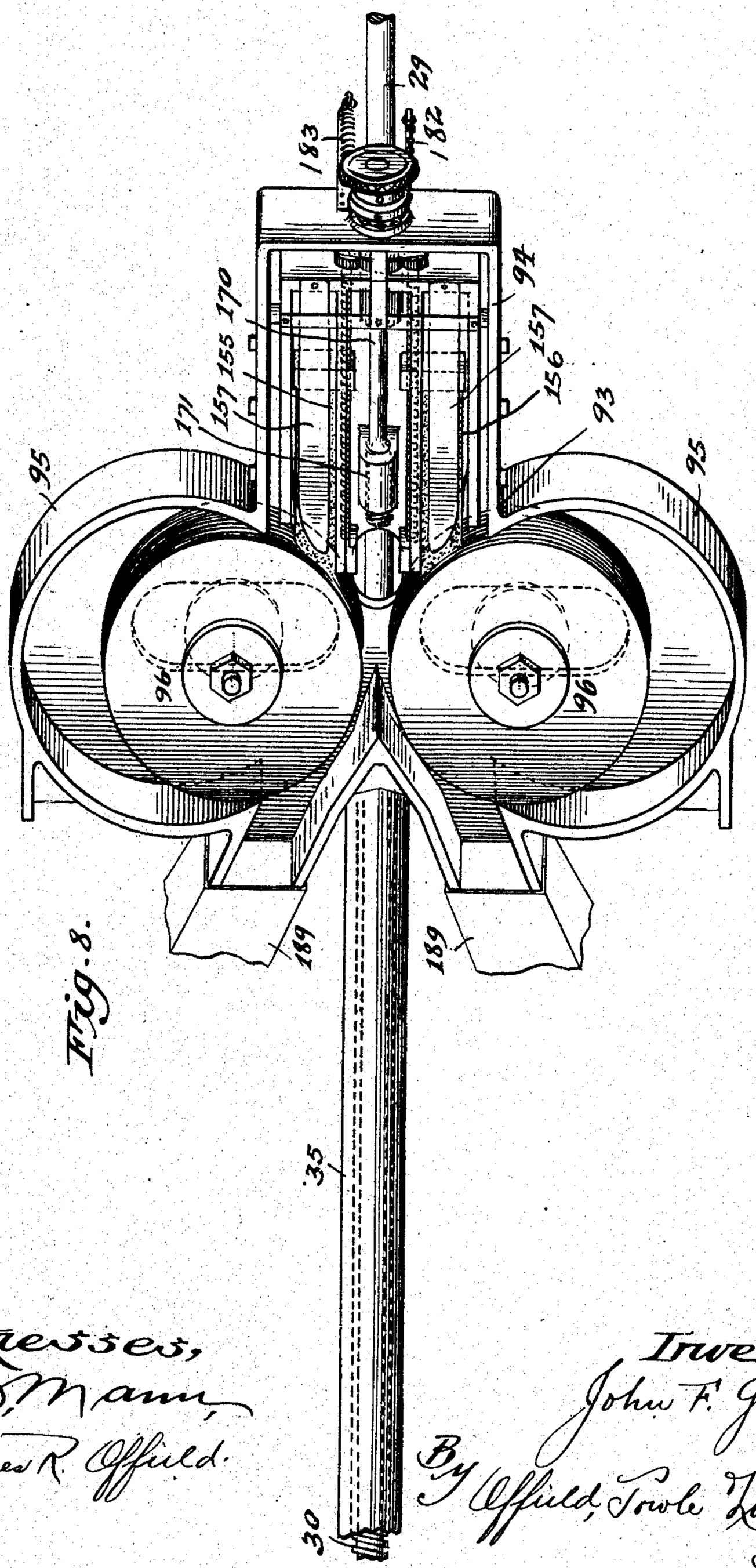

Fig. 8.

Witnesses,
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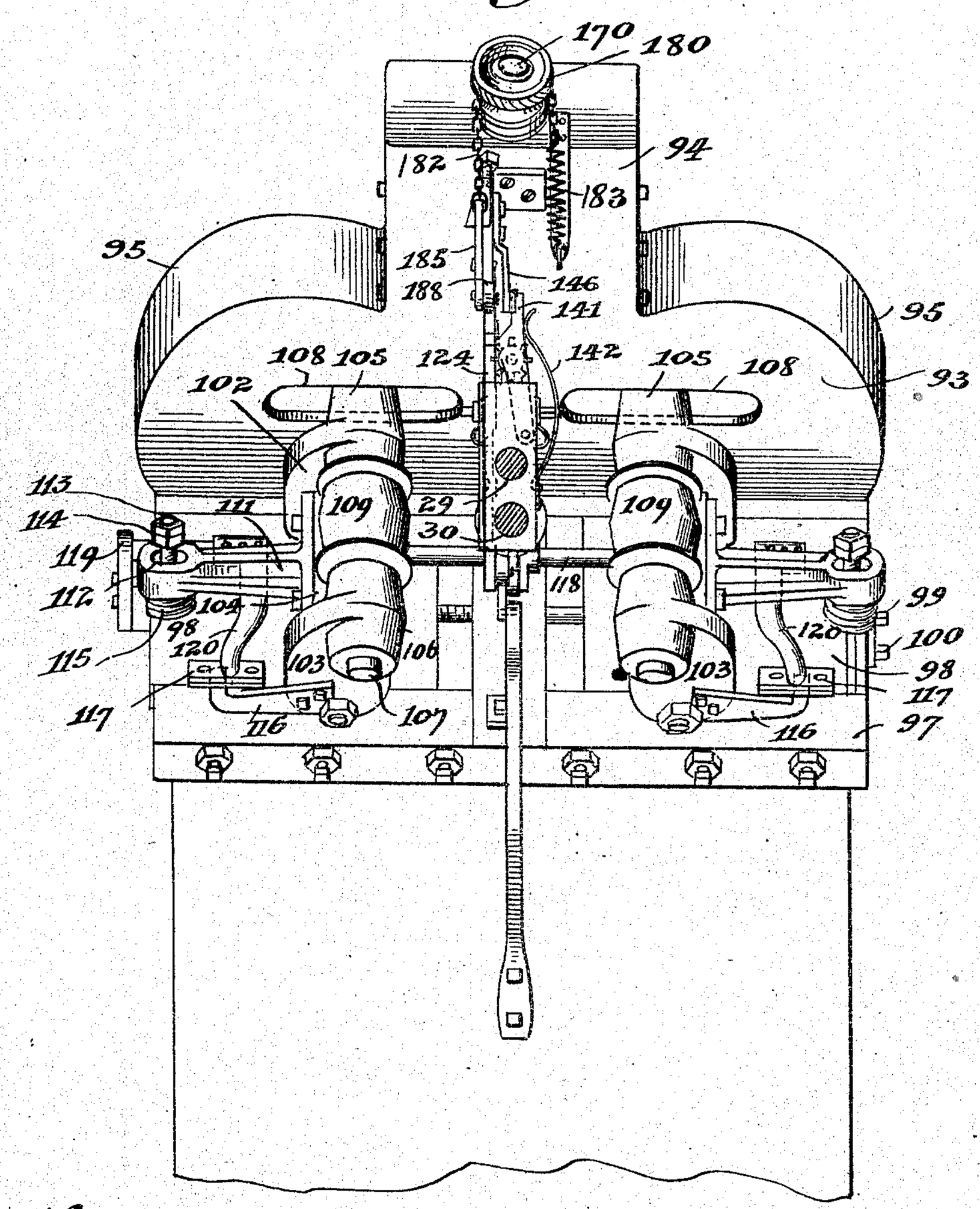
8 SHEETS—SHEET 5.

Fig. 9.



Witnesses,

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8 SHEETS—SHEET 6.

Fig. 10.

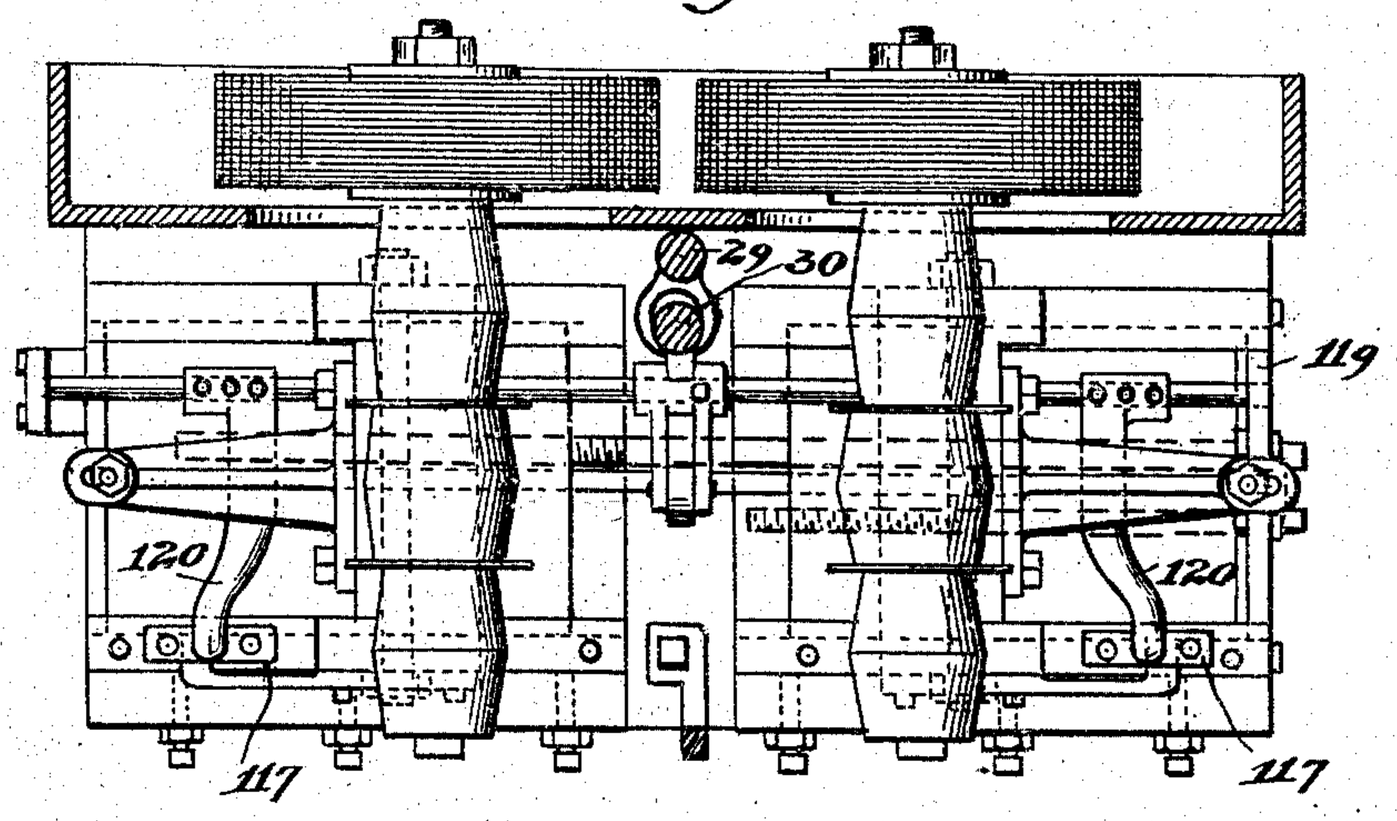
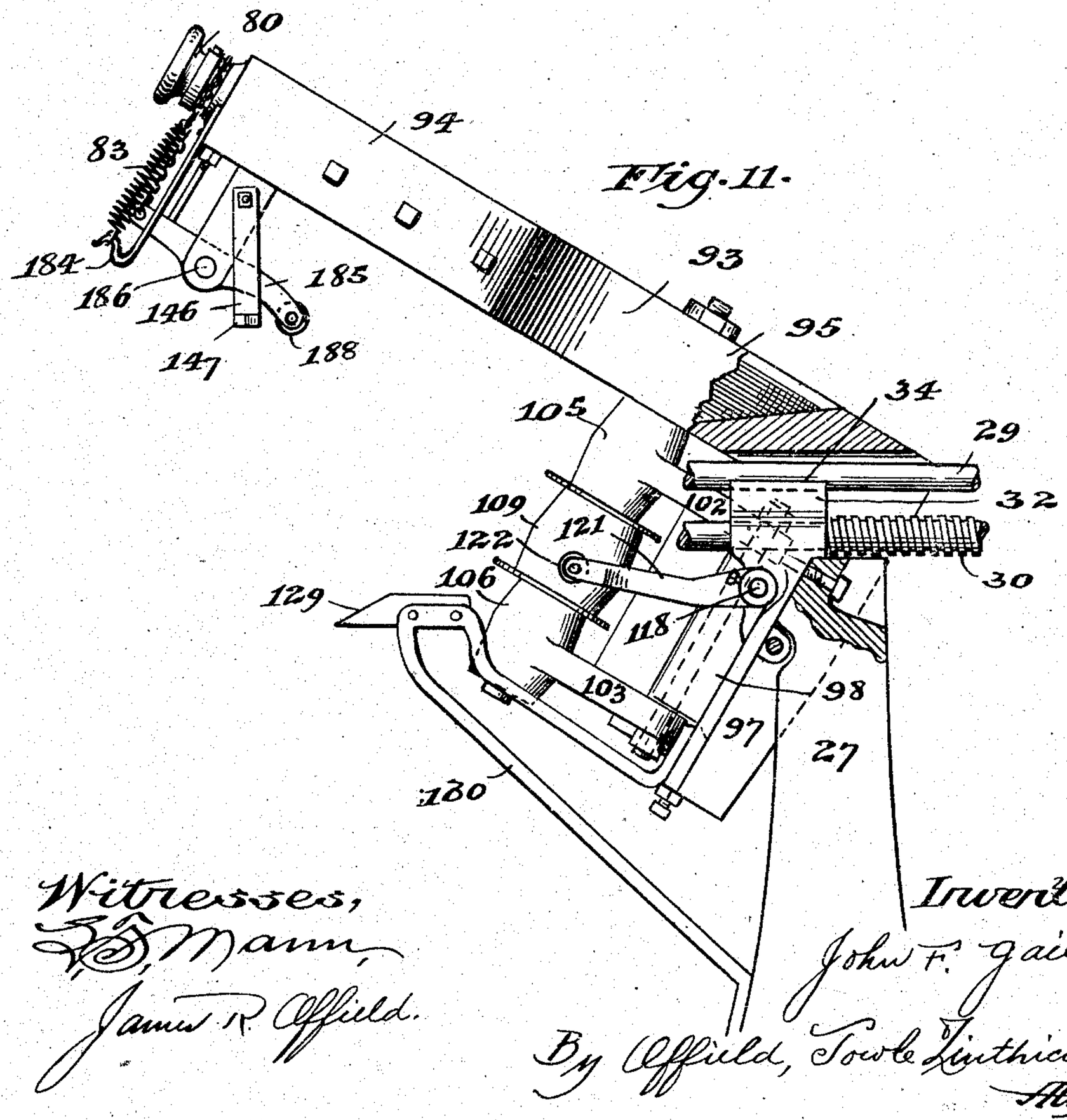


Fig. 11.



Witnesses,
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8 SHEETS—SHEET 7.

Fig. 12.

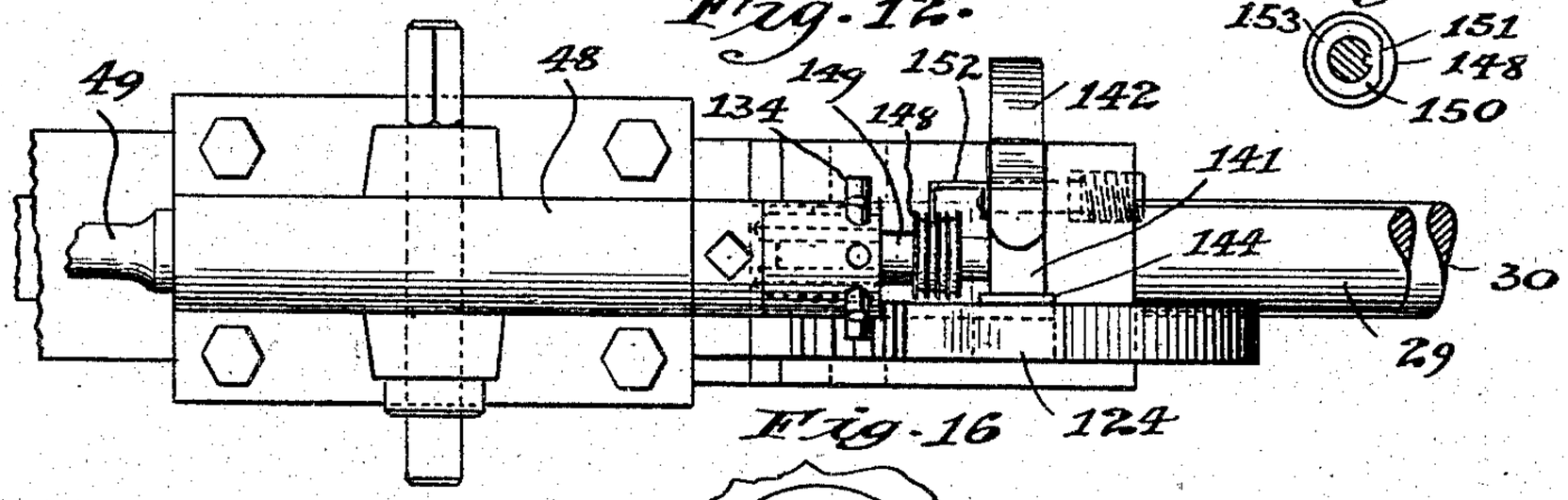
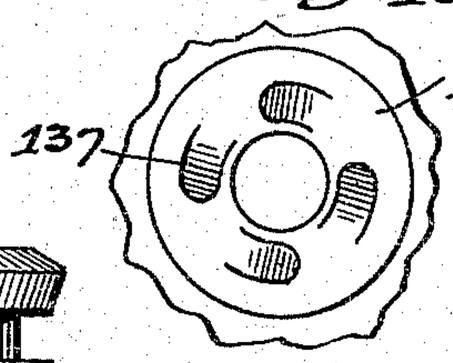


Fig. 16

Fig. 18.



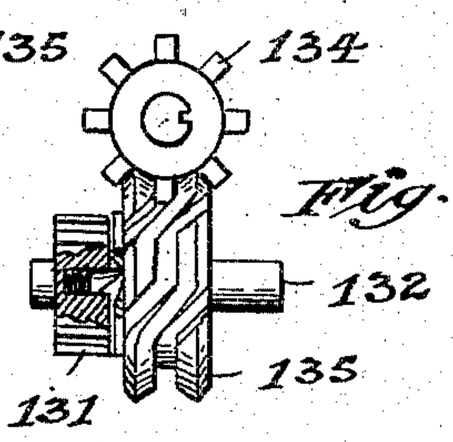


Fig. 17.

Fig. 15.

Fig. 13.

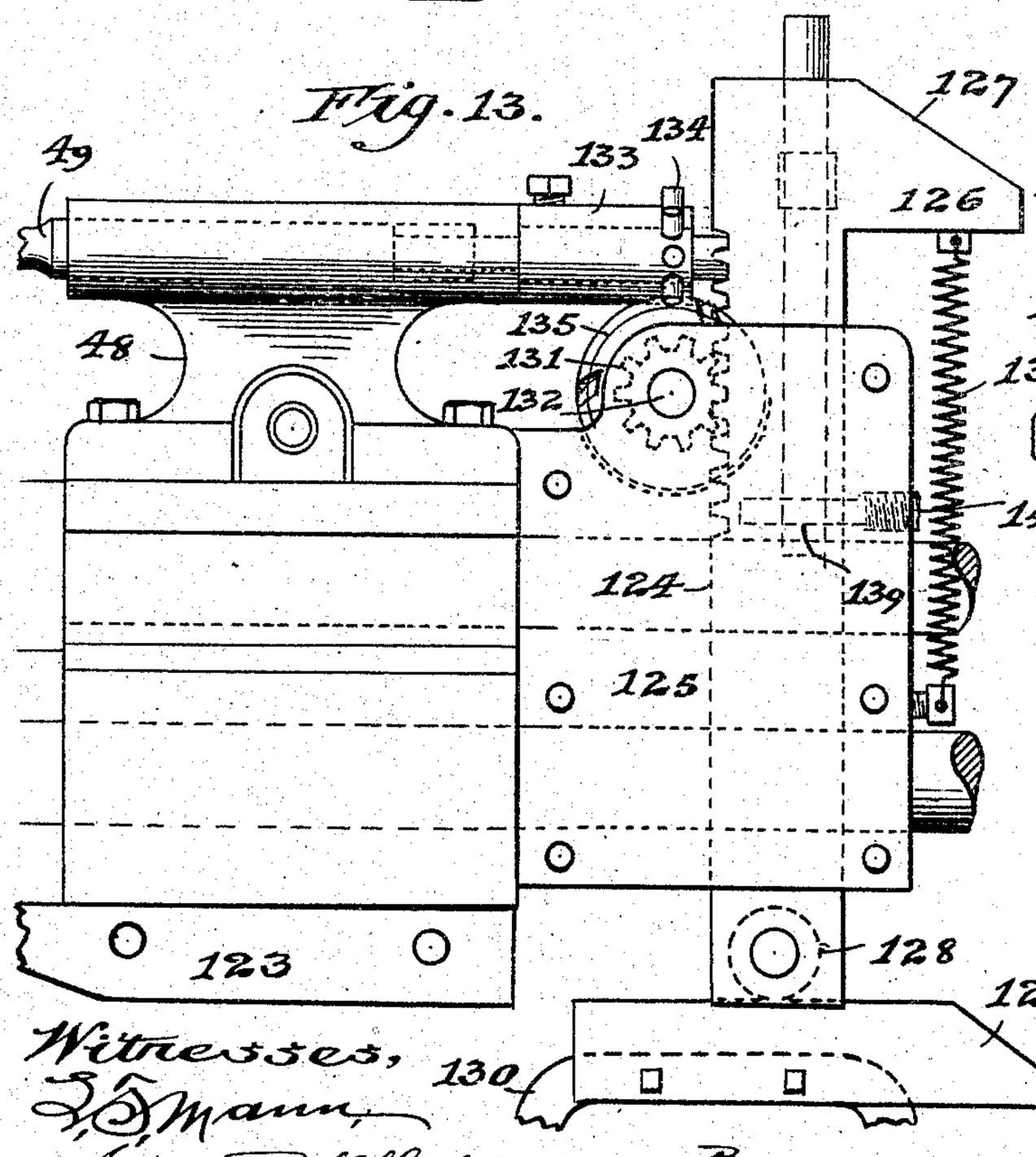
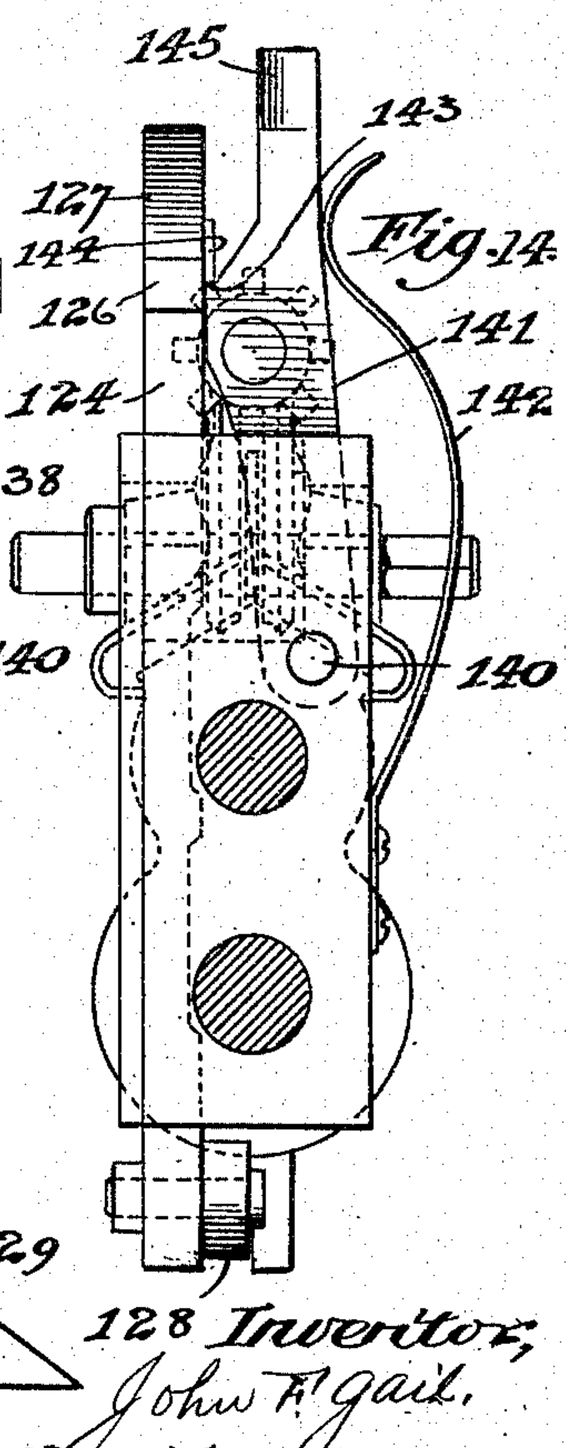


Fig. 14.



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8 SHEETS—SHEET 8.

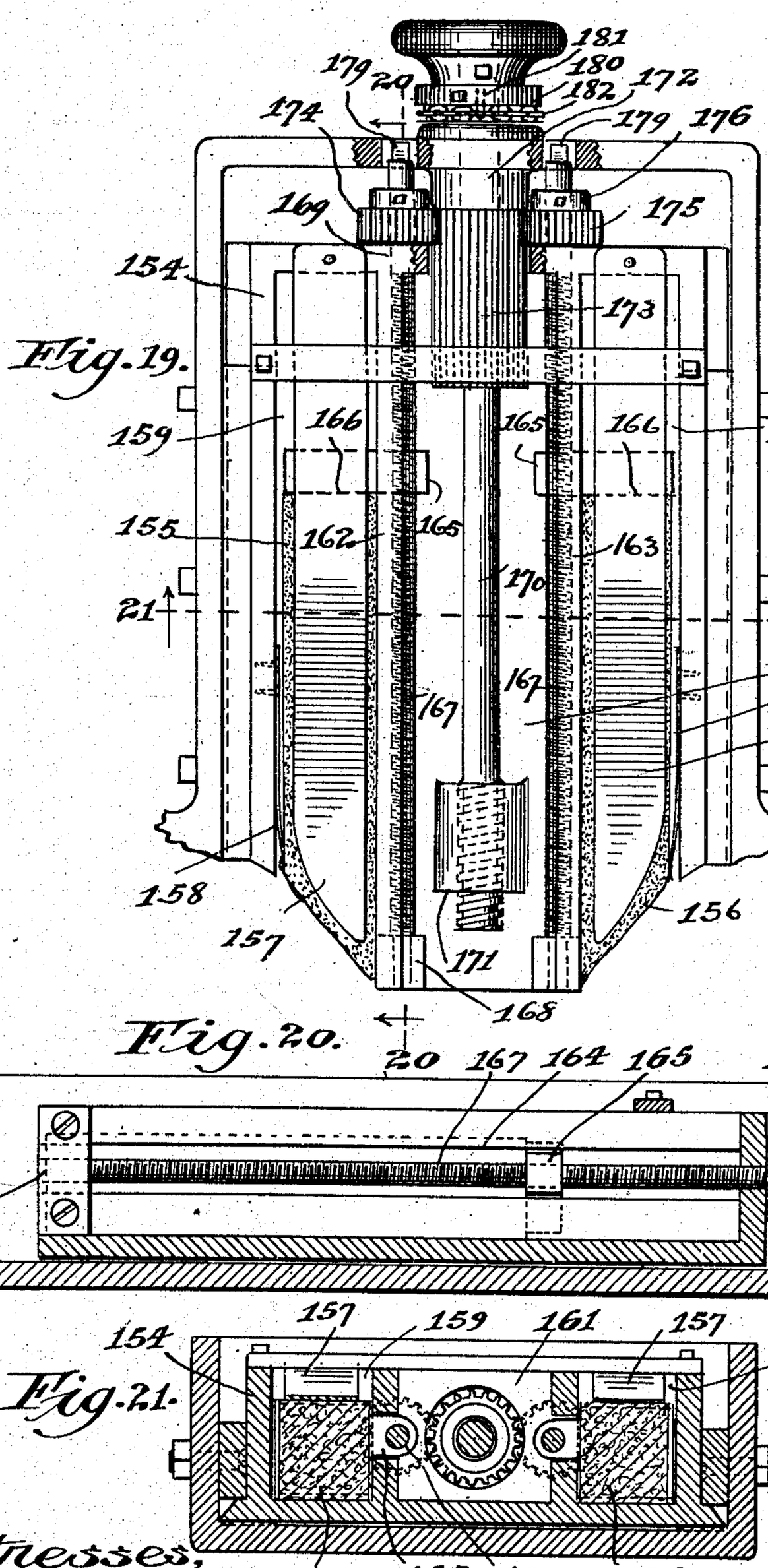

Fig. 19.

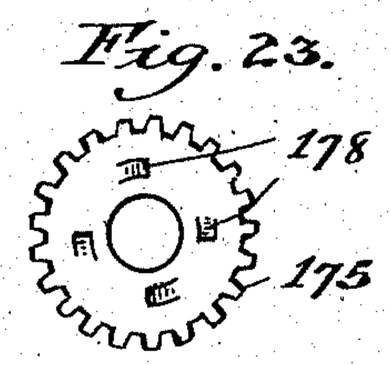

Fig. 23.

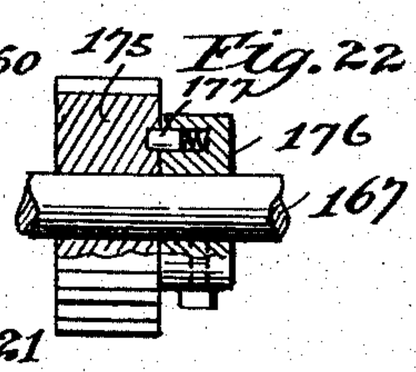

Fig. 22.

Fig. 20.

Fig. 21.

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UNITED STATES PATENT OFFICE.

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BUFFING MECHANISM.

No. 928,253. Specification of Letters Patent. Patented July 20, 1909.

Application filed July 27, 1908. Serial No. 445,636.

To all whom it may concern:

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

My invention relates to mechanism or machines for burnishing or polishing metallic parts or pieces, such as, for example, the tubes or posts of brass bedsteads. In order to remove from such tubes or similar parts to be buffed any longitudinal scratches on their surfaces, I incline the buffer wheels, desirably made up of a series of disks or layers of cloth, to the longitudinal axis of the tube and provide means for reciprocating the tube between a pair of such wheels, abradant being occasionally or periodically applied to the working surfaces of the wheels. The machine has a timing device which stops the operation of the tube after a predetermined period of action of the wheels thereon, notifying the operator or workman that an unbuffed tube may be inserted in the machine in place of the finished one, this being practically all that the workman has to do in carrying on the work of burnishing or polishing the tubes. In order that the entire surface of the tube may be acted on one or more times by the wheels, I equip the machine with means for giving the tube an intermittent rotation or turning, also supplying the device with mechanism for spreading the buffer wheels apart during such turning of the tube, whereby they will be rendered temporarily inoperative thereon. An abradant or polishing material applying governing means forms a part of the mechanism and enables the workman to readily control a predetermined or automatic application of the abradant or polishing material to the wheels.

Other features of novelty and improvement will be made apparent to those skilled in this art from the following description, which should be read in connection with the accompanying drawings, forming a part of this specification, and wherein I have illustrated a preferred and desirable embodiment of the invention, using like reference characters for the same parts throughout the various views.

In the drawings—Figure 1 is a side elevation of my improved buffing mechanism, certain parts being broken away; Fig. 2 is a side elevation of the main body or portion of the reciprocatory carriage carrying the tube while it is being operated upon by the buffer wheels; Fig. 3 is a top plan view, on an enlarged scale, of the head end portion of the machine, certain parts being omitted; Fig. 4 is a side elevation of the construction shown in Fig. 3; Fig. 5 is a vertical cross-section on line 5—5 of Fig. 4; Fig. 6 is a fragmentary perspective view of the pattern wheel and associated mechanism timing the period of action of the buffer wheels on the tube; Fig. 7 is a side elevation of the central portion of the machine which is equipped with the buffer wheels; Fig. 8 is a plan view of the construction shown in Fig. 7; Fig. 9 is a view of the mechanism shown in Fig. 7 as viewed from the right hand end; Fig. 10 is a section on line 10—10 of Fig. 7, as viewed in the direction indicated by the arrows; Fig. 11 is a side elevation, parts being broken away, of that portion of the machine equipped with the buffer wheels; Fig. 12 is a plan view of the tail stock portion of the reciprocatory carriage carrying the tube to be buffed; Fig. 13 is a side elevation of the construction shown in Fig. 12; Fig. 14 is an end elevation of the parts shown in Figs. 12 and 13; Figs. 15, 16, 17 and 18 are detail views of the different parts of the operating mechanism; Fig. 19 is a face view of the abradant supporting and applying mechanism; Fig. 20 is a section on line 20—20 of Fig. 19, as viewed in the direction indicated by the arrows; Fig. 21 is a cross-section on line 21—21 of Fig. 19; and Figs. 22 and 23 are detail views of portions of the abradant operating mechanism.

The frame of the machine includes two end posts or standards 25 and 26 and a similar central post 27, the two posts 25 and 27 being tied and joined together by a rod 28. A long cylindrical rod or shaft 29 is supported at its opposite ends by the posts 25 and 26, and below this shaft I employ a long screw 30 having cylindrical portions fitting in bearings 31, 32 (Fig. 7) and 33 on the tops of posts 25, 27 and 26, respectively, the rod or shaft 29 resting in a socket 34 on the top of bearing 32 (Fig. 11). Adapted to reciprocate on this shaft and screw I provide a carriage 35 having depending portions 36 and 37 at its opposite ends, the former of which is threaded at 38 to receive the screw 30, while the latter is apertured at 39 to receive the cylindrical por-

tion of the screw shaft, these head and tail portions 36 and 37 being also apertured at 40 and 41 for the accommodation of the rod or shaft 29. The portion of this carriage 35 between its ends is of the cross-section and shape clearly indicated in Fig. 5, being recessed on its under surface for the reception of the rod or shaft 29, and having its top face 42 inclined in opposite directions. In order to protect and shield the screw 30 from the abradant material employed, I fasten to each side of the carriage 35 a depending skirt or apron 43, shown in section in Fig. 5. The device is also supplied with a split head stock 44 slidable on the carriage and adapted to be clamped in any adjusted position by turning the handle 45, this head stock carrying a rotatable spindle or tube support 46 having an angular end 47 to fit in the end of the tube to be burnished. The other end or portion of the reciprocatory carriage 35 has mounted thereon a tail stock 48 also supplied with a tube supporting rotatable spindle or center 49, the tube being held between and rotatable with the two spindles or centers 46 and 49.

On the protruding end 50 of one of the cylindrical parts of the long screw 30 I fix a tight intermediate pulley 51, on opposite sides of which I place wider pulleys 52 and 53 loose on the shaft. A suitably-driven belt 54 is adapted to rotate either one of the pulleys 51 or 52 depending upon how the belt is shifted, while a crossed belt 55 coöperates with the pulleys 51 and 53 to rotate either one of the same in the opposite direction, also depending upon its shifting by mechanism hereinafter described. It should be apparent, therefore, that when the belt 54 is on the tight pulley 51 the screw 30 will be rotated in one direction to carry the carriage along, while when the pulley 55 is on the tight pulley 51 the screw and carriage will be moved in the opposite direction. In order to shift these belts to accomplish the desired results, I slidingly mount on the top of post 25 a bar 56 having secured to its front face a belt-shifter 57 equipped with a loop 57[a] passing around the belt 55, while secured to the back face of the reciprocatory bar 56 I provide another belt-shifter 58 supplied with a loop 58[a] encircling the belt 54. The front face of this sliding bar 56 has a comparatively narrow outstanding flange or strip 59, and a wider alined flange or strip 60, with a notch or recess 61 between the two adapted to accommodate the upper end of an arm 62 fastened to a shift rod 63 having a bearing on the top of post 25 at 64 (Fig. 4) and in a bracket 65 (Fig. 7) secured to one side face of the middle post 27. A spring 62[a] fastened to the lower end of arm 62 and bearing against the side of the head of post 25 normally yieldingly maintains the upper end of arm 62 in notch 61. The head end of the carriage 35 coöperates with a collar 66 fixed by means of a set-screw to the shift rod 63 to move the latter longitudinally in one direction, while a lug or projection 67 on one side of the head stock co-acts with a collar 68 (Fig. 7) to move the rod in the opposite direction. It will, therefore, be apparent that assuming that the belt 54 encircles and is turning the tight pulley 51 and the screw 30, belt 55 being on pulley 53, and that the carriage is traveling toward the head post 25, that when the carriage strikes the collar 66 it will move the shift rod 63 longitudinally toward the pulleys, and through the arm 62 will shift the sliding bar 56 and the belt shifters carried thereby so as to carry the belt 54 on to the loose pulley 52 and the belt 55 from the loose pulley 53 on to the tight pulley 51, causing a reverse rotation of the screw and a travel of the carriage in the opposite direction until the projection or finger 67 strikes the collar 68 and shifts the rod 63 in the opposite direction, in so doing carrying the belt 55 from pulley 51 to pulley 53 and the belt 54 from the loose pulley 52 to the tight pulley 51, a reverse movement of the parts then occurring.

The device for causing the automatic cessation of the operation of the parts of the machine is mounted on the top of post 25 and includes the following parts: On a transverse stud or shaft 69 (Figs. 3 and 4) I loosely mount a notched cam or controlling wheel 70 having one or more teeth or cam portions 71, the edge of which is at a slightly greater distance from the axis of the wheel than the main periphery or edge surface of the wheel. Coöperating with the notches of this cam or governing wheel and adapted to prevent reverse rotation of the wheel, I provide a spring 72 intended to fit in the notches and ride on the edge of the cam or governing wheel from one notch to the other as the wheel is fed around. Rigid with this notched cam or governing wheel and beside the same I provide a ratchet wheel 73 outside of which on the stud or shaft 69, and loose thereon, is an oscillatory pawl-plate 74 carrying a pawl 75 coöperating with the teeth of the ratchet 73, the pawl-plate being normally pulled downwardly into the position shown in Fig. 4 by a small coil-spring 76. Also mounted on this pawl-plate is a roller 77 with which co-acts a sliding cam 78 having a front beveled surface 79, the cam being rigidly fastened to and movable with the sliding bar 56 by an arm or support 80. It should be understood that as this cam 78 reciprocates it passes under the roller 77 lifting the same, due to the beveled surface 79, and the pawl-plate 74, causing a partial rotation or turning of the ratchet wheel 73 and attached notched governing or cam wheel 70, because of the pawl connection 75 between the pawl-plate and the ratchet. When the cam slide

78 recedes or moves away from beneath the roller 77 the pawl-plate 74 and the pawl are pulled downwardly by the spring 76, the pawl idly riding over one or more of the teeth of the ratchet.

Pivoted on the top of post 25 at 80[a] is an upwardly-spring-pulled controlling or governing arm 81 having on its top edge a tongue or finger 82 adapted to enter the notches of the governing or cam wheel 70 as they are brought into position above the same, this tongue or finger riding on the periphery or edge of the wheel 70 as the latter turns. On its under surface this arm 81 carries a double-ended wedge or cam 83 normally raised out of the path of travel of the arm 62 by the spring 84 which holds the arm 81 in its uppermost position. However, when the tongue or finger 82 is engaged by one of the teeth or cam portions 71 of the controlling or governing wheel 70, the arm 81 is swung down on its pivot 80 in opposition to the action of the upwardly-pulling spring 84 sufficiently to bring the cam 83 into the path of travel of the upper end of the shifting arm 62, and when this arm rides on to this cam it is swung out of the notch 61, in opposition to the action of spring 62[a], or in other words, disengaged from the sliding block 56. Owing to the extreme width, however, of the rib or flange 60 the cam 83 is unable to disengage the bar 62 therefrom, although it is of sufficient thickness to disengage it from the end of the narrower bar or rib 59.

In order to lock the sliding cam 78 in a variety of positions so as to maintain the pair of belts 54 and 55 on the proper pulleys and prevent their displacement I supply the two edges of this sliding cam 78 with a plurality of notches 85, with which coöperate rollers on the free ends of a pair of levers or pivoted arms 86 fulcrumed at 87 and yieldingly pulled together or toward one another by the coil expansion spring 88. The rollers, as will be readily understood, ride on the notched edges of the cam 78 as it is shifted in unison with the sliding block 56, the rollers by co-action with the notches aiding in maintaining the belt-shifters and other parts in the desired positions.

In order to shift the bar 56 and the attached belt-shifters manually after the operation of the machine has been automatically stopped, I pivot a swinging arm 89 to any suitable overhead support (not shown) and connect to this arm a forked rod 90, the forked or bifurcated end of which 91 straddles the belt-shifter bar 57, the rod 90 being held in position by passing through an aperture in a suitable supporting bracket 92 fastened at the top of post 25.

On the top of the central post or standard 27 I mount an inclined buffer wheel casing 93 having an upper central portion 94 accommodating the abradant blocks and the two curved or substantially-circular wings or side extensions 95 adapted to house a pair of rotary buffer wheels 96, each desirably composed of a plurality of circular disks or layers of cloth held together in any approved and suitable manner. Extended downwardly from the under side of and at substantially right-angles to the casing 93 is an inclined support or bracket 97 having its top face supplied with a transverse undercut groove 97[a] adapted to slidingly receive a pair of blocks 98 on which the bearings for the shafts and buffer wheels are swingingly mounted or hinged, these blocks being adjustable toward and from one another by the screw-shafts 99 and 100 having a threaded connection therewith and also having angular protruding ends to which wrenches may be applied to secure the proper adjustment of the blocks and buffer wheels. Since this is a usual and ordinary construction further description is deemed unnecessary. Each of the two blocks 98 has extended through the same a bolt or shaft 101 on the protruding ends of which are swingingly mounted the arms 102 and 103 cross-connected by a bar 104, and having at their upper free ends the pair of bearings 105 and 106 in which turns the shaft 107 of one of the buffer wheels 96. It will be observed that the lateral wings or extensions 95 of the casing 93 are slotted or apertured at 108 to receive and permit movement of portions of the upper bearings 105, the pulleys 109 for the buffer wheel shafts being conveniently disposed between the bearings 105 and 106 and rotated by belts 110, one of which is shown in Fig. 1. Each cross or connecting bar 104 has bolted thereto an outstanding arm 111 slotted at 112 at its outer end for the accommodation of a fixed bolt 113 equipped at its upper end with one or more nuts 114 limiting upward movement of the arm 111, which is normally pushed up by a coil-spring 115 disposed between the under surface of the arm and the top face of the sliding block 98. These two springs 115, therefore, act to normally swing the bearings of the buffer shafts on their fulcrums, tending to bring the buffer wheels together and against the tube to be burnished disposed between them.

When the tube is being given a partial rotation to bring new sections or portions thereof into the field of operation of the inclined buffer wheels, it is desirable to have the latter out of contact therewith, and I accordingly provide means for spreading apart or separating these wheels during such turning of the tube. This means includes the following parts: Each bearing arm 103 has fixed thereto and projected outwardly a rock-arm 116 supplied on its upturned end with an elongated wear-plate or member 117 which is made of substantial length so that

the means described hereinafter as coöperating therewith will be in operative connection or relation therewith regardless of the adjustment of the sliding block 98 carrying the buffer wheel bearings and shaft. A transverse rock-shaft 118 is rotatably mounted in bearings 119 and has fixed thereto a pair of depending fingers 120, the ends of which overlie and bear against the top faces of the blocks 117. At the center of the machine this shaft 118 has fixed thereto an outwardly-extended arm 121 bearing at its outer end a roller 122 which normally lies in the path of travel of a wedge-shaped cam 123 (Figs. 1, 7 and 13) secured to the bottom of the tail block 37 of the reciprocatory carriage 35. When the carriage approaches the end of its travel to the left, as the machine is viewed in Fig. 1, this wedge cam 123 engages the upper side of the roller 122, depressing the arm 121 and rocking the shaft 118 in its bearings, at the same time causing the ends of the arms 120 to bear down on the blocks 117, which results in the outward swinging of both bearings for each of the two buffer wheels, these movements of the parts occurring in opposition to the action of the springs 115. During such separation of the buffer wheels the tube is turned by means of mechanism described hereinafter. As soon as the cam recedes slightly the buffer wheels, their shafts, and bearings, are again permitted to swing toward one another so that the buffer wheels bear against and act upon opposite faces of the tube being burnished, this reverse movement of the parts being occasioned by the expansion of the springs 115 which just previously have been compressed by the action of the reciprocatory cam 123.

A rack 124 (Figs. 12, 13 and 14) is vertically slidable in an extension 125 mounted on the rear end of the tail portion 37 of the carriage 35, the rack having at its top end a rearward extension 126 with a beveled or cam top surface 127, while the bottom end of the rack is equipped with a roller 128 which is adapted to coöperate with and ride upon a stationary cam or wedge 129 secured on a bracket 130 fastened to the rear face of the central post 27 (Fig. 1). The teeth of this rack mesh with those of a pinion 131 loosely mounted on a transverse shaft 132 supported in the upper portion of the extension 125 adjacent to the rear end of the spindle 29 which carries at its rear end a sleeve 133 provided with a plurality of radially-extended posts or fingers 134 which coöperate with the cam grooves of a cam 135 also loose on the shaft 132, a pawl and ratchet connection being used between the pinion 131 and the cam 135. This pawl and ratchet connection includes a spring-pressed pin 136 housed in an aperture in one side of the pinion or gear 131, and the series of depressions 137 on the adjacent side face of the cam 135. The coöperation of these parts, that is, the gear with the cam and the cam with the fingers or pins is clearly shown in Fig. 17. Every time, therefore, that the rack is pushed upwardly by the stationary cam or wedge 129 the gear and cam 135 are turned, and in so moving partially rotate the tube-supporting spindle 49 because of the coöperation of the radial pins 134 with the cam 135, it being understood that the sleeve 133 is fixed, as by means of a set-screw, to the spindle 49. When the roller 128 rides off of the cam 129 the rack is pulled down again by the contractile spring 138, this movement of course rotating gear 131 in the opposite direction, but this turning of the gear, however, is not transmitted to the cam 135 because of the pawl and ratchet connection between these parts.

Back of the rack 124 and pivoted on the extension 125 at 139 on the cylindrical portion of a screw 140, I provide a swinging lock or latch 141 pressed toward the rack by a leaf-spring 142 and having a shoulder 143 adapted to coöperate with a block 144 on the rear face of the rack 124. At its upper end this latch or lock is somewhat curved or beveled at 145 on its front face. When the shoulder 143 engages the under edge of the block or projection 144, due to the action of spring 142, the lock or latch maintains the rack in elevated or what may be termed displaced position until the lock or latch is swung on its pivot by means hereinafter described to release the rack. To press back this latch or lock every time that it passes by the same in back-retaining position, I mount on the upper end of the casing 93 a depending arm 146 having on its lower end a releasing cam 147.

It is desirable to have the rack retained or locked temporarily in elevated or displaced position sometimes, and at other times it is preferable to prevent the lock or latch from locking the rack in raised position, and I provide suitable means which determines whether or not the lock or latch will be permitted to hold the rack elevated. It might be stated preliminarily to a description of the construction and operation of the device for applying the abradant or polishing material to the buffer wheels that this device is actuated by the cam surface 127 of the rack 124 during the backward movement of the tube carrying carriage, provided the rack is locked in displaced or elevated position. If, therefore, the lock or latch is at times prevented from holding the rack elevated, then during those reciprocations of the carriage the abradant or polishing material will not be applied to the working faces of the buffer wheels.

The lock or latch governor or controller 148 is longitudinally-slidable on and rotatable with an extension 149 of the tail stock

spindle 49 and comprises a plurality of disks or sections 150 disposed side by side and pinned or otherwise connected together. These disks have one or more flat or low portions 151, the various disks being differently formed so as to have a variety of high and low parts. Fastened to the side of the latch or lock 145 is a bent arm or finger 152, the free end of which is adapted to ride on the periphery of any one of the disks 150, depending upon the position of this latch controller or governor on the spindle extension 149, it being understood that the spring 142 which acts on the latch holds this arm 152 in engagement with any one of the disks or sections 150. When any one of the flat or low portions 150 of the disk with which the arm 152 is coöperating is opposite the end of the arm, the latch is permitted to approach the rack sufficiently to engage the projection or block 144, but when the end of this arm 152 is bearing on one of the rounded or high portions of the disk the latch or lock is held away from the rack sufficiently to prevent locking engagement therewith. To shift this lock controller on the spindle it is merely necessary to retract the latch so as to disengage the arm 150 from the controller and then slide the latter along until the desired disk or section is opposite the arm, whereupon releasing of the lock allows the parts to come together, certain collars or spacers 153 being provided between the disks or sections to prevent unintentional displacement of the controller or governor on the spindle. It should, therefore, be apparent that by providing a plurality of these disks or sections differing in shape and contour the coöperation of the lock or latch with the rack may be readily adjusted and controlled.

In the portion 94 of the casing 93 I slidingly mount a multiple compartment carriage or support 154 adapted in the present instance to contain and carry a pair of blocks or bodies 155 and 156 of abradant or polishing material, each body of material being held firmly in place by a top and side spring 157 and 158, (Fig. 19) respectively, bearing thereupon. As is clearly illustrated in Fig. 19, these blocks of abradant are disposed in the longitudinal parallel compartments or chambers 159 and 160, respectively, the carriage also having a central chamber or compartment 161 separated from the side chambers 159 and 160 by the longitudinal walls 162 and 163, which are each longitudinally slotted at 164 to accommodate the inwardly-extended ears 165 of a pair of nuts 166 bearing against the top or rear ends of the abradant blocks. This part of the mechanism is also equipped with a pair of long parallel screws 167 having suitable bearings at 168 and 169, the screws passing through threaded apertures 165 of the nuts 166. It should be obvious, therefore, that as these screws are turned the follower nuts 166 may be caused to travel so as to project the abradant blocks out of their supporting and housing carriage, the nuts being prevented from turning because of the ears which fit in the slots 164 and because the nuts 166 are of angular shape fitting in correspondingly-shaped compartments 159 and 160. A main screw shaft 170, which has a threaded engagement with a boss or projection 171 rising from the floor or bottom of the central compartment 161, has a cylindrical portion rotating in a bearing 172 at the top of the device, the threaded connection at the lower end of this shaft being of quick or abrupt pitch, whereby a comparatively slight turning of the shaft produces a substantial longitudinal shifting of the abradant carriage and the blocks of abradant or polishing material carried thereby. This screw shaft 170 near its upper end is equipped with an elongated pinion or gear 173, the teeth of which mesh with those of a pair of pinions 174 and 175 loosely mounted on the upper ends of the screws 167, a pawl and ratchet connection being supplied between each of these pinions 174 and 175 and a collar 176 adjacent to the pinion and fixed to the shaft 167. This pawl and ratchet connection is illustrated in Figs. 22 and 23 and consists of a spring-pressed pin 177 housed in an aperture of the collar and coöperating with depressions or recesses 178 in the side faces of the pinion. If, therefore, the main screw-shaft 170 is oscillated, the abradant carriage and the blocks of abradant will be carried toward and from the buffer wheels, applying the abradant to the working faces thereof, and the follower nuts 166 will be advanced a small amount, due to the gear and pawl and ratchet connections between the screw-shaft 167 and the main shaft 170, causing a feeding or forward projection of the blocks of abradant a slight amount, sufficient to compensate for the wearing off of the same by the buffer wheels. The main gear or pinion 173 is made elongated, so that the pinions 174 and 175 will be in constant engagement therewith during the entire extent of travel of the abradant carriage. If for any reason it is desired to feed the abradant outwardly manually, wrenches may be applied to the angular or square ends 179 of the screws 167.

On the outer end of the central screw shaft 170 there is fixed a grooved pulley or collar 180, fitting in the groove of which and pinned to the collar at 181 I employ an operating chain 182, one end of which is fastened to a spring 183, the other end of the spring being secured to a bracket or hook 184, the other end of the chain being connected to one end of a lever or rock arm 185 fulcrumed at 186 on a bracket 187 secured to the under side of and depending from the casing 93, and at

the free end of this arm or lever 185 I employ a roller 188 adapted to coöperate with the cam or wedge surface 127 of the rack 124.

In order that the dust and flying abradant necessarily produced incident to the operation of this machine may be drawn away, I provide the casing 93 at the lower portions of the lateral sections 95 with tubes or pipes 189 through which the dust, abradant, and lint from the wheels may be drawn off by suitably-applied suction.

The operation of this machine is substantially as follows: assuming that a tube 190 is supported by the rotatable spindles of the head and tail stocks, and is being operated upon by the inclined buffer wheels rotated by belts 110, this operation will occur in the following manner:—When the carriage 35 and the tube are traveling to the right, as the machine is viewed in Figs. 1 and 4, the belt 54 is idly rotating the loose pulley 52, while the crossed belt is rotating the feed screw 30 through the tight pulley 51, the belts being yieldingly held in this position by the engagement of the rollers on the ends of the spring-actuated arms 86 fitting in or engaging the right-hand notches of the sliding cam 78 as the same is viewed in Fig. 3. When the carriage and tube reach the limit of their movement to the right the lug or finger 67 on the head stock strikes the collar 68 on rod 63, shifting the latter to the right and through the arm 62 and sliding block 56 shifting belt 55 on to the loose pulley 53 and belt 54 on to the tight pulley 51, which arrangement of belts reverses the direction of rotation of the screw 30, causing a reverse travel of the carriage. The belts are yieldingly maintained in this new position by the rollers or arms 86 engaging the left-hand notches of the sliding cam 78. When the belts were shifted as described above this cam 78 was also moved to the right, due to its connection with the slide 56, and in so moving this cam or wedge end passes under the roller 77, lifting to a slight amount the rotary pawl-plate 74 and pawl 75, causing a slight turning of the ratchet wheel 73 and the associated governing or pattern wheel 70, during this turning the spring 72 riding from one notch of the governing or pattern wheel into the next. When the carriage reaches its limit of movement to the left, as the machine is viewed in Figs. 1 and 4, its end 36 strikes the collar 66 on the shift rod 63, moving the arm 62, slide 56, and sliding cam 78 to the left, thereby again shifting the belt 54 on to the loose pulley 52 and the crossed belt 55 on to the tight pulley 51, which positions of the belts, as will be readily understood, cause a reverse travel of the carriage. When this sliding of the cam 78 to the left occurs, its end passes out from under the roller 77, permitting the pawl-plate 74 and pawl 75 to respond to the downward pulling of the coil-spring 76, the pawl idly riding over the teeth of the ratchet, as will be readily understood. This reciprocation of the carriage and tube, and the step by step feeding around of the notched cam or governing wheel 70, continues uninterruptedly until one of the cam portions or teeth 71 engages the cam lever 81, and when this occurs this cam lever is depressed so as to bring the double-ended cam 83 into the path of travel of the arm 62. If the carriage is moved toward the right, when the upper end of this arm 62 strikes the cam 83 the arm is not released from the slide 56 because the cam 83 does not displace the arm sufficiently to free it from the end of the wider flange or rib 60, so that the reciprocation of the carriage continues until the bar 61 strikes the cam 83 when traveling in the opposite direction, that is, toward the left. Under such circumstances the arm 62 is freed from the notch and rides idly on the edge of the flange or rib 59, further shifting of the belts not occurring. The parts are so positioned and related that this disengagement of the arm from the slide occurs when both of the belts 54 and 55 are on the loose pulleys 52 and 53, so that the machine stops with the belts in inoperative relation with respect to the screw 30. This cessation of movement of parts of the machine notifies the workman that the tube has been finished and that a new one may be substituted in its place, and after such positioning of the new tube the operator shifts the lever or arm 89 so as to slide the block 56 and belt shifters, bringing one of the belts on to the tight pulley and permitting the arm 62 to drop into the notch 61.

Every time the carriage reaches the limit of its movement to the left the cam 123 of the tail stock depresses arm 121 and spreads the buffer wheels apart, as described above. While the wheels are thus separated the roller 128 on the bottom end of the sliding rack 124 rides on to the stationary cam 129, elevating or displacing the rack, which movement thereof, by the mechanism described above, turns the tube and tail stock spindle a partial revolution, the rack being locked in elevated or displaced position provided the rack controller 158 is in such position as to permit such action. When the carriage starts to recede, and preferably before the buffer wheels have again come in contact with the tube operated upon, the roller 188 on lever 185 rides up the inclined surface 127, pulling down one end of chain 182 and rocking the screw shaft 170, thereby causing a downward feed of the abradant carriage and blocks of abradant to the buffer wheels, the slight outward feeding of the abradant blocks occurring at the same time due to the small travel of the nuts 166 on the screws 167 rotated by means of the central gear 173 and co-acting pinions 174 and 175. As soon as the roller

188 rides over the end of the rack, spring 183 pulls the chain 182 in the opposite direction, reversing the rotation of the screw shaft 170, which turning thereof retracts the abradant carriage and the blocks of abradant. No backward travel of the nuts 166 relatively to the sliding carriage occurs because of the pawl and ratchet connection between the gears 174 and 175 and their respective screw shaft 167.

It will be apparent to those skilled in the art that the times of application of the abradant to the buffer wheels are readily controlled by shifting the governor 148, that the extent of rotation of the tube at each actuation thereof may be modified by using sleeves 133 with different numbers of pins 134 and cams 135 to correspond, and that the length of time of reciprocation of the carriage and tube can be readily modified by changing the cam or governor wheels 70, a number of these wheels being provided with different numbers and spacings of cam portions or notched teeth.

Although I have described in detail all of the various features of my machine, it is to be understood that the invention is not limited and restricted to this precise embodiment, because the invention is susceptible of a variety of embodiments and the structural elements and features of the machine shown and described may be changed within wide limits without departure from the heart and essence of the invention.

I claim:

1. In a machine of the character described, the combination of means to reciprocate the piece to be buffed, and one or more buffers adapted to operate upon said piece and transversely inclined to the longitudinal axis thereof, substantially as described.

2. In a machine of the character described, the combination of means to reciprocate the piece to be buffed, one or more buffers adapted to operate on said piece, means to move said buffer or buffers away from said piece, and means to automatically partially rotate said piece when the buffer or buffers are moved away from and are inactive upon said piece, substantially as described.

3. In a machine of the character described, the combination of means to reciprocate the piece to be buffed, one or more buffers adapted to operate on said piece, means to periodically move said buffer or buffers away from said piece, and means to automatically partially rotate said piece each time that the buffer or buffers are moved away therefrom and while they are inactive thereon, substantially as described.

4. In a machine of the character described, the combination of means to reciprocate the piece to be buffed, one or more buffers adapted to act on said piece and transversely inclined to the longitudinal axis thereof, means to periodically move said buffer or buffers away from said piece, and means to automatically partially rotate said piece each time that said buffer or buffers are moved away therefrom and while they are inactive thereon, substantially as described.

5. In a machine of the character described, the combination of means to reciprocate the piece to be buffed, one or more buffers adapted to act on said piece and inclined to the longitudinal axis thereof, and means to automatically stop the reciprocation of said piece after a predetermined period of action of said buffer or buffers on said piece, substantially as described.

6. In a machine of the character described, the combination of means to reciprocate the piece to be buffed, one or more buffers adapted to act on said piece, means to periodically move said buffer or buffers away from said piece, means to automatically partially rotate said piece each time said buffer or buffers are moved away therefrom and while they are inactive thereon, and means to automatically stop the reciprocation of said piece after a predetermined period of action of said buffer or buffers on said piece, substantially as described.

7. In a machine of the character described, the combination of means to reciprocate the piece to be buffed, one or more buffers adapted to act on said piece and inclined to the longitudinal axis thereof, means to automatically and periodically move said buffer or buffers away from said piece, means to automatically partially rotate said piece when said buffer or buffers are moved away therefrom and while they are inactive thereon, and means to automatically stop the reciprocation of said piece after a predetermined period of action of the buffer or buffers thereon, substantially as described.

8. In a machine of the character described, the combination of means to reciprocate the piece to be buffed, a buffer adapted to act on said piece, a swinging mounting for said buffer, means to swing said mounting to move said buffer away from said piece, and means to automatically turn said piece when said buffer is away from and is inactive upon the same, substantially as described.

9. In a machine of the character described, the combination of means to reciprocate the piece to be buffed, a buffer adapted to act on said piece, a swinging mounting for said buffer, a spring acting on said mounting and tending to force said buffer against said piece, means to swing said mounting in opposition to the action of said spring to move said buffer away from said piece, and means to automatically turn said piece when the buffer is away from and inactive thereupon, substantially as described.

10. In a machine of the character described, the combination of means to reciprocate the

piece to be buffed, a buffer wheel adapted to act on and inclined to the longitudinal axis of said piece, means to rotate said buffer wheel, a swinging mounting for said buffer wheel, means to swing said mounting to move said buffer wheel away from said piece, and means to automatically turn said piece when said buffer wheel is away from and inactive thereon, substantially as described.

11. In a machine of the character described, the combination of a carriage adapted to carry the piece to be buffed, a buffer to act on said piece, a screw to reciprocate said carriage, means to rotate said screw in opposite directions to cause the reciprocation of said carriage, and means controlling the actuation of said screw rotating means, whereby to stop the reciprocation of the carriage when the piece has been properly buffed, substantially as described.

12. In a machine of the character described, the combination of a buffer, a carriage adapted to carry the piece to be buffed, a screw to reciprocate said carriage, means to rotate said screw in opposite directions to cause the reciprocation of said carriage, and means controlling the operation of said screw rotating means, said carriage governing the actuation of said controlling means, substantially as described.

13. In a machine of the character described, the combination of a buffer, a reciprocatory carriage adapted to carry the piece to be buffed, means to reciprocate said carriage, and means controlling the actuation of said carriage reciprocating means, including a pattern or governing wheel, means to rotate said pattern or governing wheel step by step during the reciprocation of said carriage, and means co-acting with said pattern wheel adapted to stop the reciprocation of said carriage after a predetermined period of action of the buffer on said piece, substantially as described.

14. In a machine of the character described, the combination of a buffer, a reciprocatory carriage adapted to carry the piece to be buffed, means to reciprocate said carriage, a notched slide controlling the actuation of said reciprocating means, an arm adapted to fit in said notch, said carriage actuating said slide through said arm, and a governing mechanism to remove said arm from said notch at the expiration of a predetermined period of action of the buffer on said piece whereby to stop the reciprocation of said carriage and piece, substantially as described.

15. In a machine of the character described, the combination of a buffer, a reciprocatory carriage adapted to carry the piece to be buffed, means to reciprocate said carriage, a notched slide controlling the actuation of said reciprocating means, an arm adapted to fit in said notch, said carriage actuating said slide through said arm, and a governing mechanism to remove said arm from said notch at the expiration of a predetermined period of action of said buffer on said piece, whereby to stop the reciprocation of said carriage and piece, including a cam pattern or governing wheel, means to turn said wheel step by step during the reciprocation of said carriage, an arm co-acting with said cam pattern or governing wheel, and a cam carried by said arm and adapted in a certain position or positions of said governing or pattern wheel to be moved by said arm into the path of travel of said arm coöperating with said notch to release said arm from said notch, substantially as described.

16. In a machine of the character described, the combination of a buffer, a reciprocatory carriage carrying a support for the piece to be buffed, means to reciprocate said carriage, a cam, a sliding rack on said carriage operated by coming in contact with said cam, a pinion the teeth of which mesh with those of said rack, and a connection between said pinion and support for the piece to be buffed, whereby each time said rack is operated by said cam said piece is given a partial rotation, substantially as described.

17. In a machine of the character described, the combination of a buffer, a reciprocatory carriage carrying a support for the piece to be buffed, a stationary cam, a sliding rack on said carriage operated by coming in contact with said cam, a pinion meshing with the teeth of said rack, a connection between said pinion and support for said piece to be buffed, whereby each time said rack is operated by said cam the piece is given a partial rotation, a spring to slide said rack back to normal position, a latch to hold said rack elevated, and means to retract said latch permitting the rack to respond to the action of its spring, substantially as described.

18. In a machine of the character described, the combination of one or more buffers, a reciprocatory carriage adapted to carry the piece to be buffed, means to reciprocate said carriage, a device to apply abradant or polishing material to said buffer or buffers, and means on said carriage to actuate said abradant or polishing material applying device, substantially as described.

19. In a machine of the character described, the combination of one or more buffers, a reciprocatory carriage adapted to carry the piece to be buffed, means to reciprocate said carriage, a device adapted to apply abradant or polishing material to said buffer or buffers, a member movable on said carriage and adapted when displaced to actuate said abradant or polishing material applying device, means to displace said movable member, a lock adapted to temporarily maintain said movable member in displaced position, and means to retract said lock to release said

movable member after it has actuated said abradant or polishing material applying device, substantially as described.

20. In a machine of the character described, the combination of one or more buffers, a reciprocatory carriage, means to reciprocate said carriage, a rotatable support on said carriage for the piece to be buffed, a device to apply abradant to said buffer or buffers, a member movable on said carriage adapted when displaced to actuate said abradant applying device, means to displace said movable member, a lock to temporarily maintain said movable member in displaced position, means to retract said lock to release said movable member after it has actuated said abradant applying device, means to turn said support and piece, a movable lock governor operated simultaneously with the turning of said support and piece and adapted in certain positions to render said lock inoperative to hold said movable member displaced, whereby under such conditions said member fails to actuate said abradant applying device, substantially as described.

21. In a machine of the character described, the combination of one or more buffers, a reciprocatory carriage, means to reciprocate said carriage, a rotatable support for the piece to be buffed on said carriage, a device to apply abradant to said buffer or buffers, a member movable on said support adapted when displaced to actuate said abradant applying device, a connection between said movable member and rotatable support whereby the former is adapted to turn the latter step by step, means to displace said movable member, a lock to temporarily maintain said movable member in displaced position, means to retract said lock to release said movable member after it has actuated said abradant applying device, a movable lock governor operated simultaneously with the turning of said support and piece and adapted in certain positions to render said lock inoperative to hold said member in displaced position, whereby under such circumstances said member fails to operate said abradant applying device, substantially as described.

22. In a machine of the character described, the combination of a buffer, a reciprocatory carriage, a rotatable support on said carriage for the piece to be buffed, means to reciprocate said carriage, a member slidable on said carriage, a stationary cam co-acting with said sliding member to displace the same, a connection between said member and rotatable support for the piece to be buffed, whereby when said sliding member is displaced by said cam said support and piece are given a partial rotation, a spring to return said sliding member to normal position, a device to apply abradant to said buffer and operated by a cam surface on said sliding member when the latter is displaced by said stationary cam, a spring-controlled latch adapted to temporarily maintain said sliding member in displaced position in opposition to the action of its spring, and means to release said latch after said member has operated said abradant applying device, substantially as described.

23. In a machine of the character described, the combination of a buffer, a reciprocatory carriage, a rotary support for the piece to be buffed on said carriage, means to reciprocate said carriage, a sliding member on said carriage, a stationary cam adapted to slide or displace said member, a connection between said member and said rotary support whereby when said member is displaced said support and piece are partially rotated, a spring acting on said member to return it to normal position, a device to apply abradant to the buffer and operated by a cam surface on said sliding member when the latter is displaced by the stationary cam, a spring-controlled latch to maintain said sliding member in displaced position, means to release said latch after said member has operated said abradant applying device, and a latch governor rotatable with said support and piece and adapted in certain positions to prevent said latch from maintaining said member in displaced position, whereby under certain conditions said member fails to actuate said abradant applying device, substantially as described.

24. In a machine of the character described, the combination of a buffer, a reciprocatory carriage, means to reciprocate said carriage, a rotatable tail stock on said carriage adapted to support the piece to be buffed, a device to apply abradant to said buffer, a member movable on said carriage and adapted when displaced to actuate said abradant applying device, means to displace said movable member, a lock to temporarily maintain said member in displaced position, means to retract said lock to release said movable member after it has actuated said abradant applying device, means to rotate said tail stock step by step by said movable member, and a multiple lock controlled co-operating with said lock, rotatable with said tail stock, and movable to bring any one of its multiple sections into operative relation with said lock, one or more of said sections when in certain positions preventing said lock from maintaining said movable member in displaced position, whereby under such conditions said member will not actuate said abradant applying device, substantially as described.

25. In a machine of the character described, the combination of a buffer, a carriage adapted to contain or support a body

of abradant, and means to move said carriage toward said buffer to bring said body of abradant into contact therewith, including an oscillatory shaft, means to oscillate said shaft, and a screw connection between said shaft and abradant carriage, substantially as described.

26. In a machine of the character described, the combination of a buffer, a carriage adapted to contain or support a body of abradant, an oscillatory shaft, means to oscillate said shaft, a screw connection between said shaft and carriage, whereby as said shaft is oscillated the body of abradant is moved toward and from said buffer, a follower bearing against the back of said body of abradant, and a connection between said oscillatory shaft and follower, whereby to advance said follower a small amount on each actuation of said shaft to compensate for the wearing off of the body of abradant, substantially as described.

27. In a machine of the character described, the combination of a buffer, a carriage adapted to contain or support a body of abradant, an oscillatory shaft, means to oscillate said shaft, a screw connection between said shaft and carriage whereby on each oscillation of said shaft the carriage is advanced toward and retracted from said buffer to apply abradant thereto, a follower bearing against the back of the body of abradant, a screw shaft, said follower coöperating with the threads thereof, meshing gears on said oscillatory and screw shafts, and a pawl and ratchet connection between the gear on the screw shaft and the screw shaft, whereby on each actuation of said oscillatory shaft the follower will project the body of abradant a small amount to compensate for its wearing off, substantially as described.

28. In a machine of the character described, the combination of a buffer, a main reciprocatory carriage adapted to carry the piece to be buffed, means to reciprocate said carriage, a carriage adapted to contain or support a body of abradant, an oscillatory shaft adapted to be operated by said main reciprocatory carriage, and a screw connection between said oscillatory shaft and said abradant carriage whereby said latter carriage advances the abradant to the buffer and retracts the same upon each actuation of said oscillatory shaft, substantially as described.

29. In a machine of the character described, the combination of a buffer, a main reciprocatory carriage adapted to carry the piece to be buffed, means to reciprocate said carriage, a carriage adapted to contain or support a body of abradant, an oscillatory shaft having a screw connection with said abradant carriage, a lever, a chain fastened at one end to said lever, pinned to said oscillatory shaft, and its other end fastened to a retracting spring, whereby as said main carriage reciprocates it is adapted to oscillate said lever on its fulcrum and through the chain oscillate said shaft to advance the abradant to the buffer because of the screw connection between said oscillatory shaft and the abradant carriage, substantially as described.

JOHN F. GAIL.

Witnesses:
WALTER M. FULLER,
CLARE L. ROSENOW.