J. F. GAIL.

BUFFING MACHINE.

APPLICATION FILED JULY 19, 1909.

957,198.

Patented May 10, 1910.

8 SHEETS—SHEET 1.

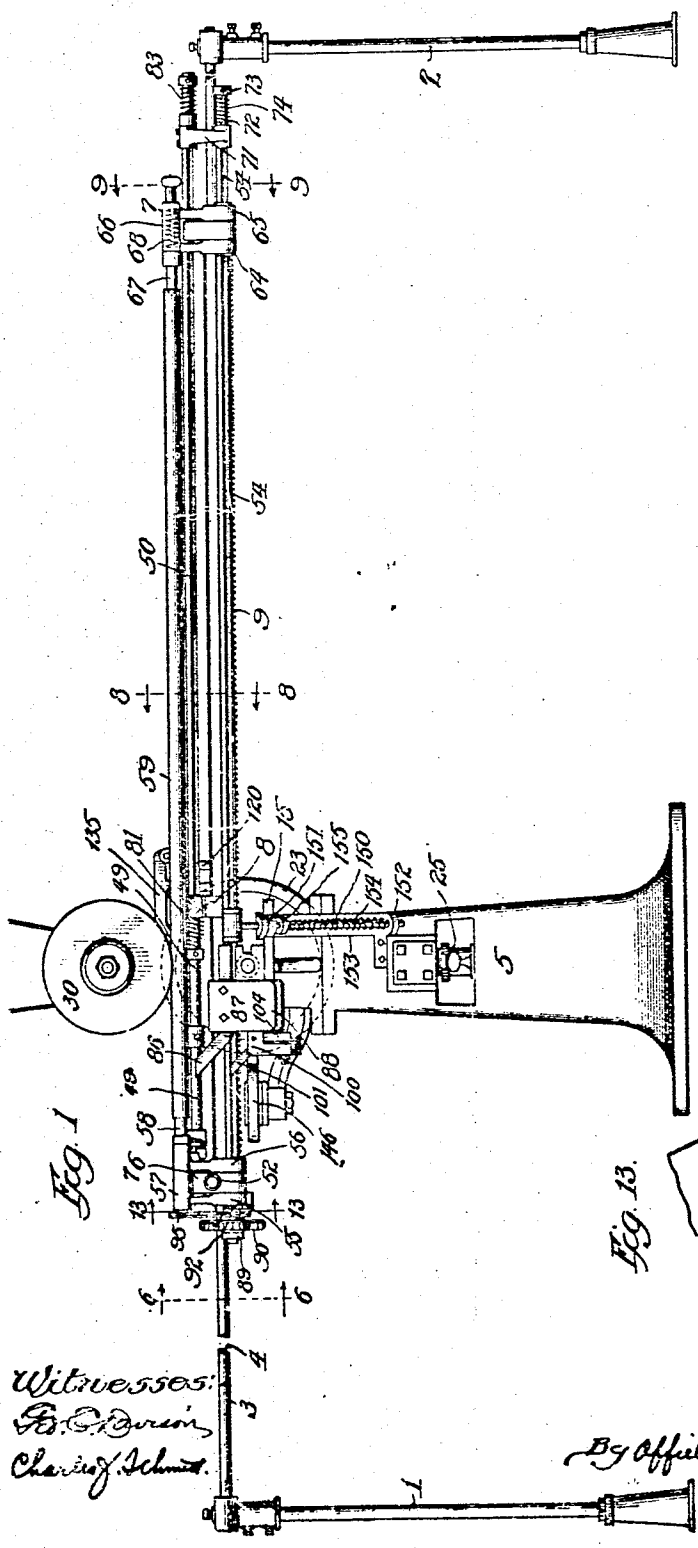

Fig. 1

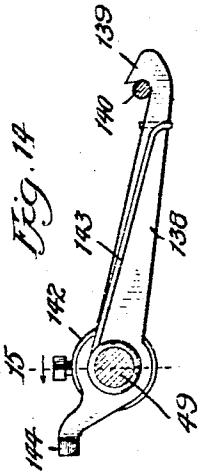

Fig. 14

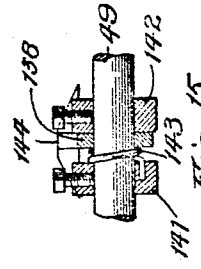

Fig. 15.

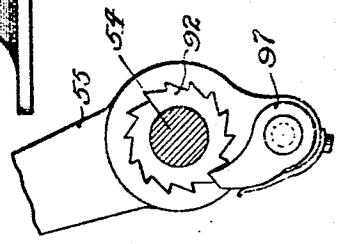

Fig. 13.

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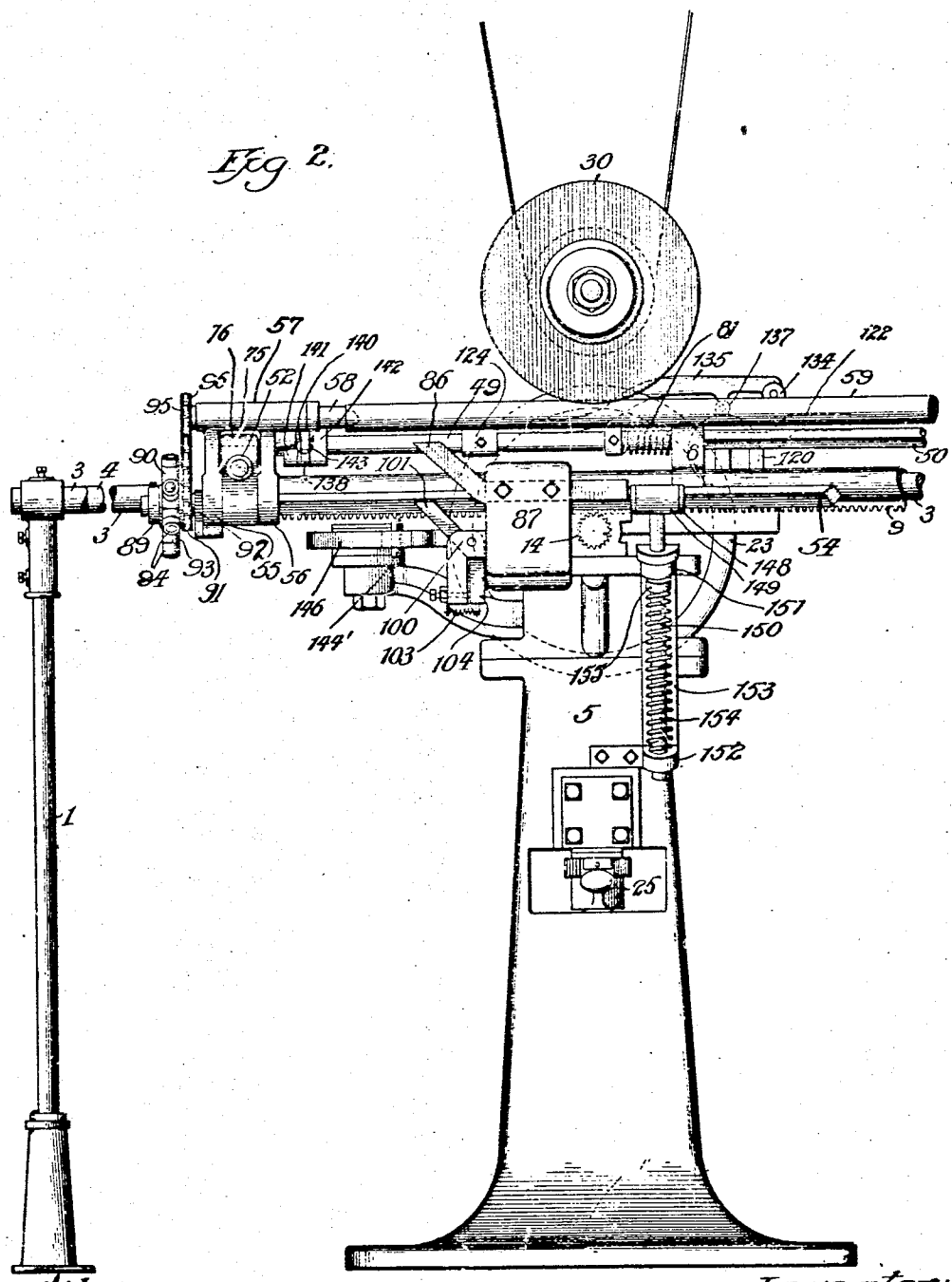
8 SHEETS—SHEET 2.

Fig 2.



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8 SHEETS—SHEET 3.

Fig. 3.

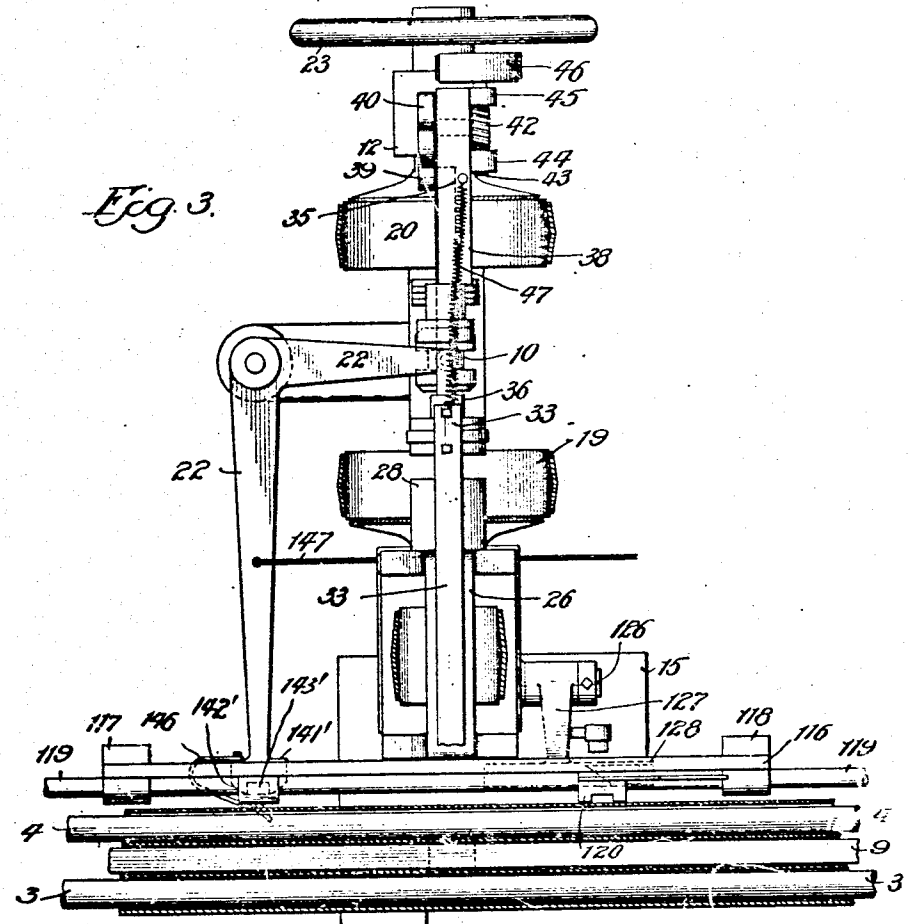

Fig. 16

Fig. 17

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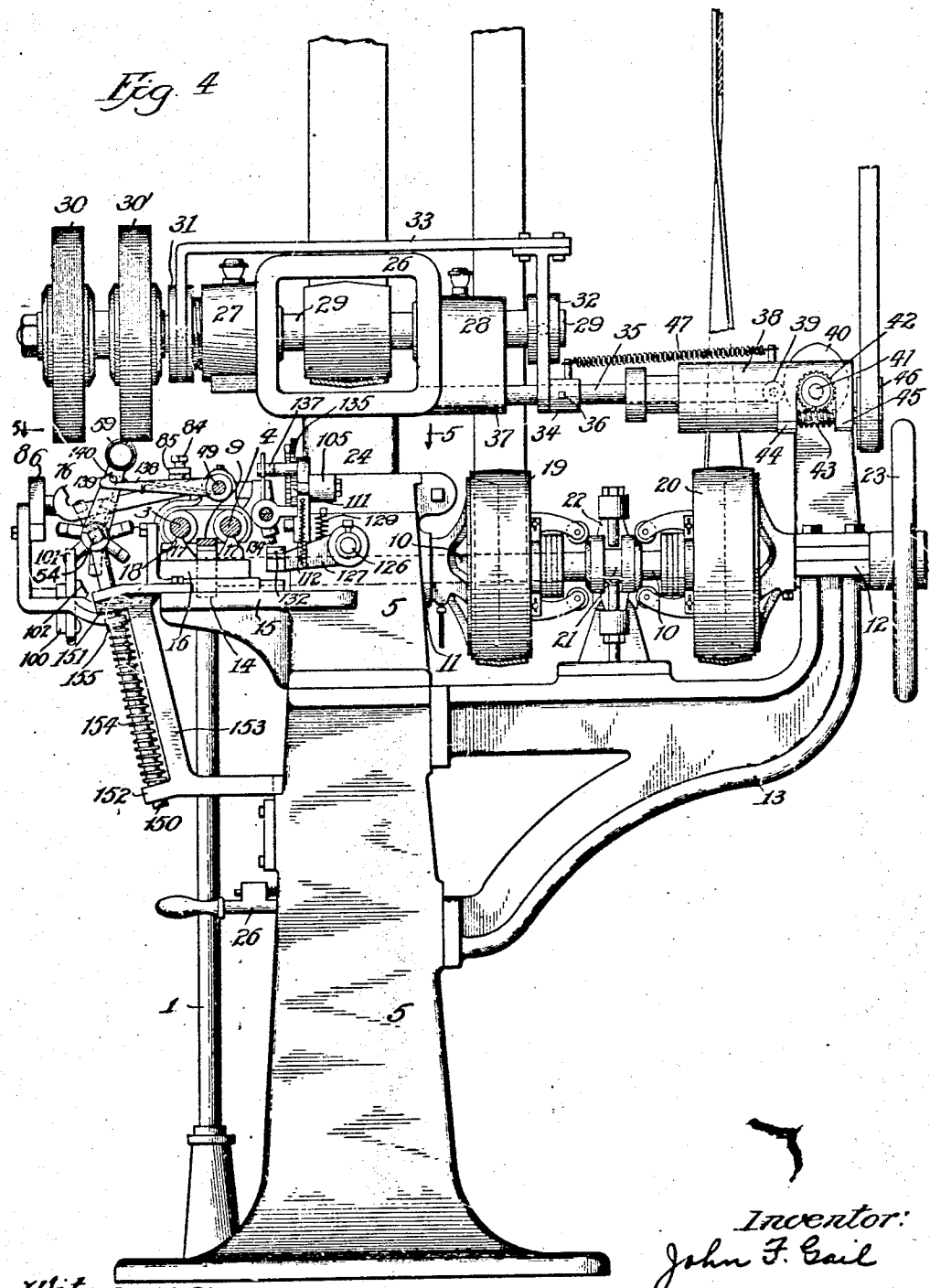
8 SHEETS—SHEET 4.

Fig. 4



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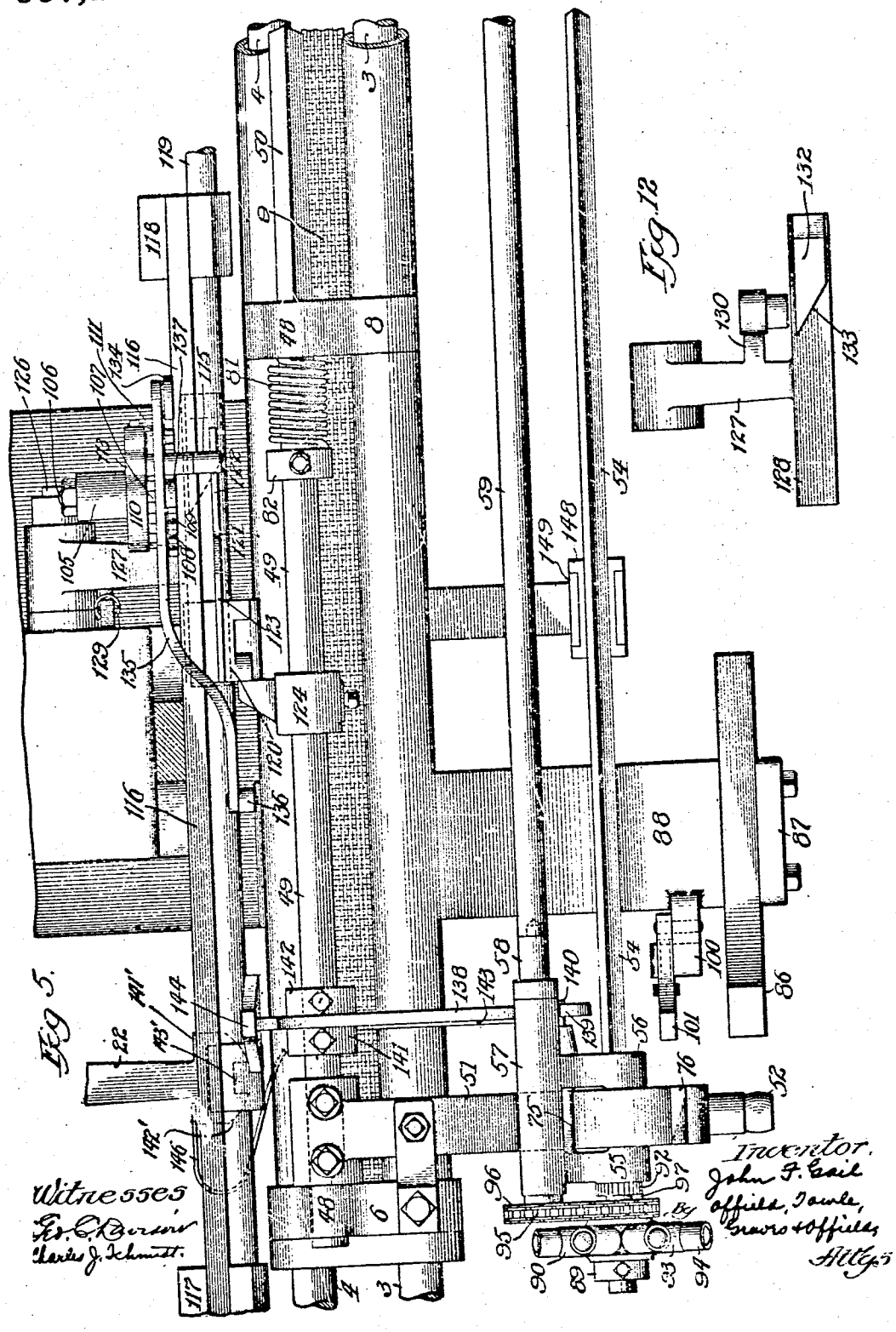

Fig. 5.

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8 SHEETS—SHEET 6.

Fig. 6

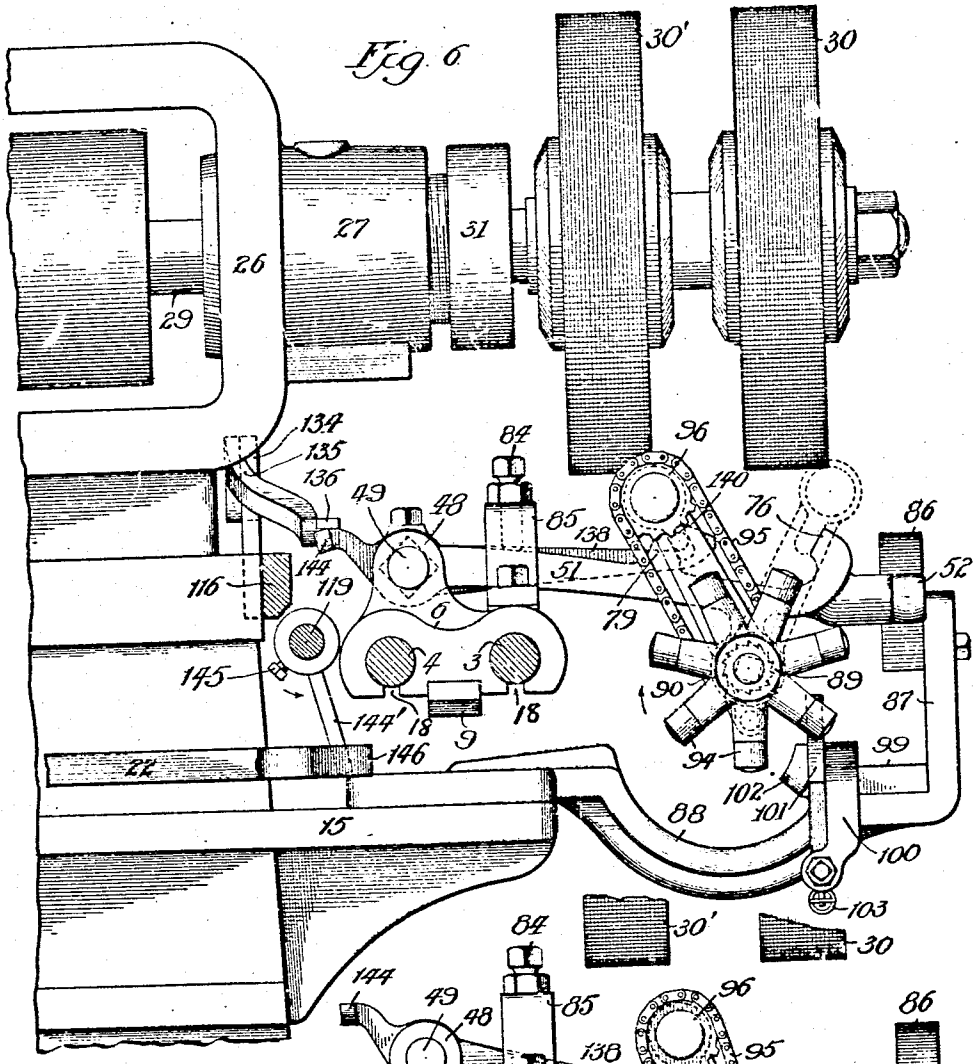
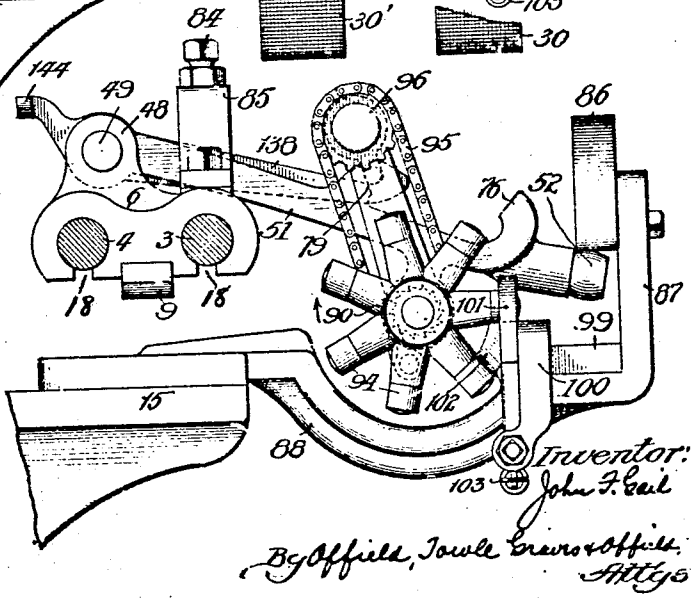


Fig. 7



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8 SHEETS—SHEET 7.

Fig. 8.

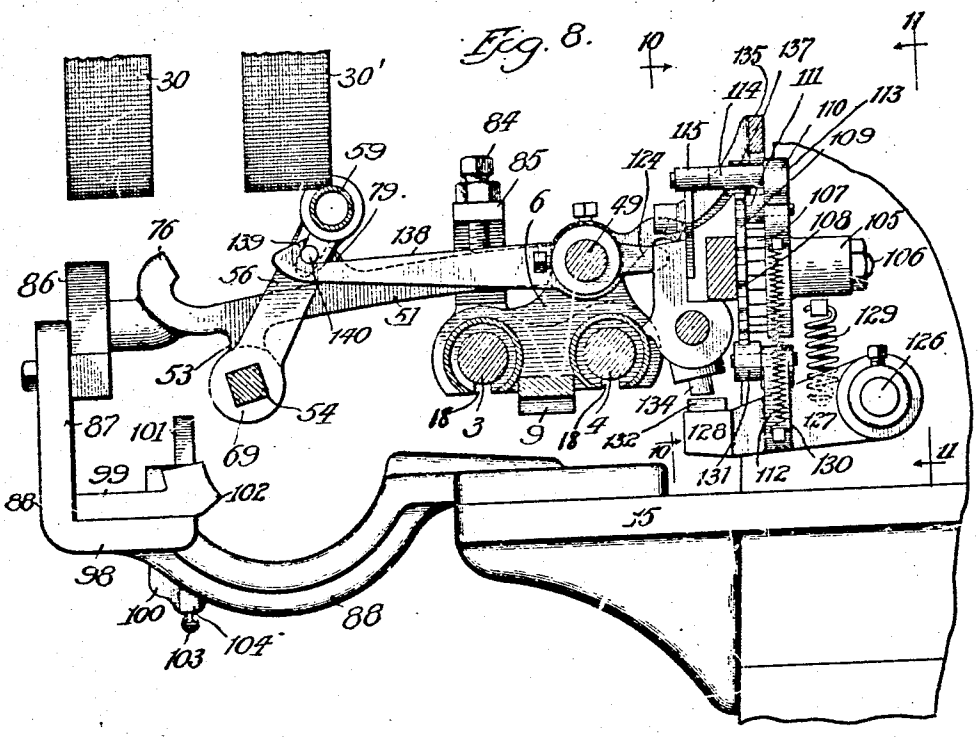
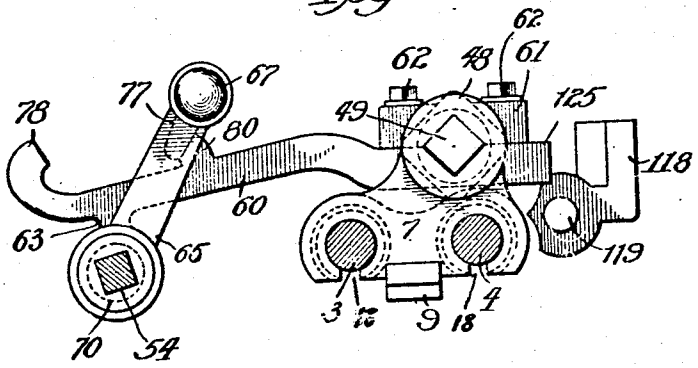


Fig. 9.



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8 SHEETS—SHEET 8.

Fig. 10.

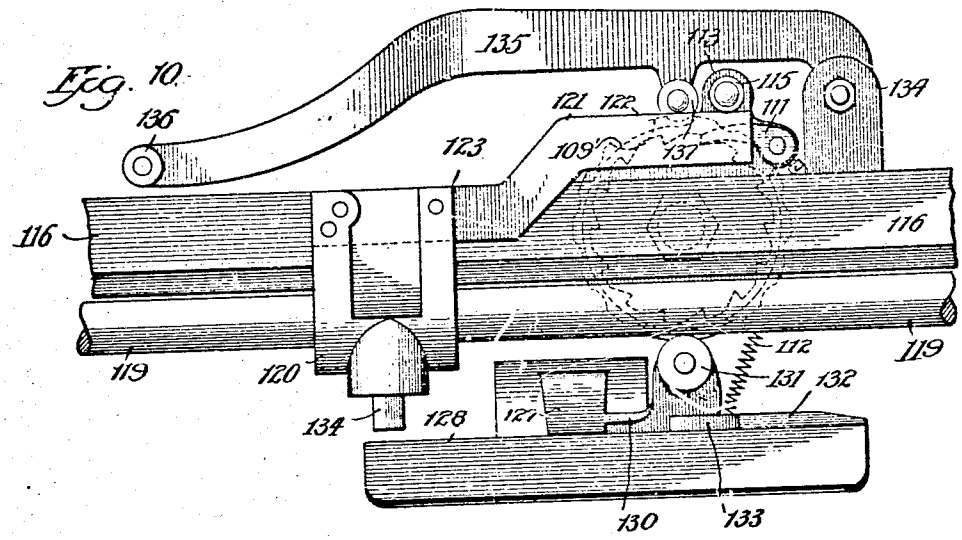
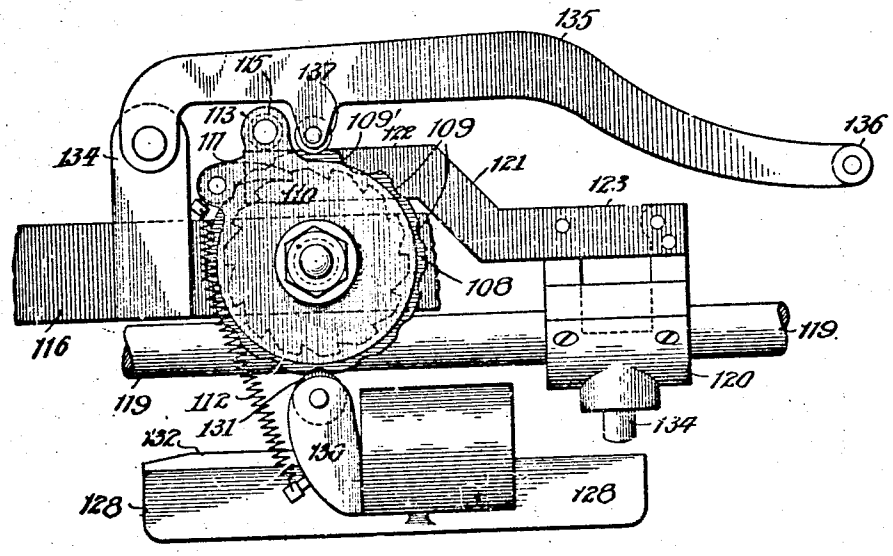


Fig. 11



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BUFFING-MACHINE.

957,198. Specification of Letters Patent. Patented May 10, 1910.

Application filed July 19, 1909. Serial No. 508,339.

To all whom it may concern:

Be it known that I, JOHN F. GAIL, residing at Kenosha, in the county of Kenosha and State of Wisconsin, have invented certain new and useful Improvements in Buffing-Machines, of which the following is a complete, clear, full, and precise specification.

My invention relates to buffing machines, more particularly to buffing machines for grinding, burnishing or polishing the surfaces of long objects such as metallic tubes, posts or the like which form parts of metallic bedsteads.

My invention may be considered as an improvement over the invention disclosed in my Patent No. 927,036, issued July 6, 1909. In the machine shown in this patent provision is made for the operation and control of only one grinding or polishing wheel, the object to be treated being reciprocated longitudinally in contact with the wheel and being automatically partially rotated axially after each reciprocation. It is very desirable and sometimes necessary to apply first a coarser wheel and then a finer wheel, and in the machine in the patent referred to which provides for only one wheel, the machine must be stopped after the object has been treated by one wheel and another wheel substituted, this requiring the expenditure of considerable time and labor.

In my present invention, I provide a plurality of wheels for the machine and automatic operating and controlling mechanism for automatically applying the objects, first to one and then to the other wheel. The object is automatically reciprocated longitudinally, under the first wheel and is given an axially rotational advance after each reciprocation until the entire surface has been gone over by the first wheel whereupon the object is carried into association with the next wheel and similarly treated. With this arrangement it is necessary only to insert an object into the machine and to remove it only when the entire buffing operation has been completed, which completion will be indicated by the stopping of the reciprocating mechanism. This improved operation also entails novel features of construction and arrangement.

On the accompanying drawings I have illustrated a desirable embodiment of my invention and in these drawings, Figure 1 is a front elevation view of the buffing machine; Fig. 2 is an enlarged front elevation of the main part of the machine on which the buffing wheels are mounted; Fig. 3 is a plan view of the parts shown in Fig. 2; Fig. 4 is a side elevation taken from the right of the body part of the machine; Fig. 5 is an enlarged plan view of the front central part taken from plane 5—5, Fig. 4; Fig. 6 is a vertical sectional view taken from line 6—6, Fig. 1; Fig. 7 is a view taken from the same line as Fig. 6 showing certain controlling cam mechanism in different position; Fig. 8 is a sectional view taken from line 8, Fig. 1, showing operation controlling mechanism; Fig. 9 is a sectional view taken from line 9—9, Fig. 1, showing tail stock mechanism; Fig. 10 is an enlarged front view of operation controlling mechanism taken from line 10—10, Fig. 8; Fig. 11 is an enlarged rear view of the mechanism shown in Fig. 10 taken from plane 11—11, Fig. 8; Fig. 12 is an enlarged plan view of stopping cam mechanism; Fig. 13 is an enlarged side view of ratchet mechanism, looking from line 13—13, Fig. 1; Fig. 14 is side showing in side elevation of the locking lever, shown in Figs. 6 and 7; Fig. 15 is a sectional view of said lever taken on line 15—15, Fig. 14; Fig. 16 is a left end view of the clutch lever and controlling pin engaged thereby; and Fig. 17 is a front view of the parts shown in Fig. 16, the spring being partly cut away.

The machine supporting structure comprises the standards 1 and 2 supporting opposite ends of guide bars or rods 3 and 4. Between these standards is the main post or standard 5 from which all the operating and controlling parts are supported. The rods 3 and 4 support a carrier frame comprising end blocks 6 and 7 and intermediate block 8, each slidably engaging bars 3 and 4, as best shown in Figs. 6 to 9, and all the blocks being connected rigidly together by a gear rack 9.

Referring particularly to Fig. 4, a shaft 10 journals at its front end in a bearing 11 mounted on the main post 5 and at its rear end journals in a bearing 12 supported by the bracket 13 extending rearwardly from

the main post 5. At its front end this shaft carries a pinion 14 which meshes with the gear rack 9 so that rotation of the said shaft will result in longitudinal movement of the gear rack. A shelf 15 extending forwardly from the main standard carries a block 16 from which guiding tongues 17 extend upwardly into the slots 18 formed in the lower faces of the carriage blocks 6, 7 and 8, and serving to prevent flexure of the gear rack, and to maintain perfect gear relations between said rack and pinion 14.

On shaft 10 between its bearings driving pulleys 19 and 20 are loosely mounted and are adapted to be clutched to the shaft by means of suitable clutch mechanism 21, the details of whose construction it is unnecessary to show here. This clutch mechanism is controlled by the movement of a bell crank clutch lever 22 to connect either the pulley 20 with the shaft to cause forward movement of the carrier frame, or to connect pulley 19 with the shaft to cause reverse movement of the carrier frame. At the rear end of the shaft a hand wheel 23 may be provided for enabling manual control of the carrier frame.

A post 24 is adapted for vertical longitudinal adjustment within the standard 5 by means of suitable mechanism 25, not shown in detail, and this post at its upper end carries a frame 26 which supports front and rear bearings 27 and 28 in which is journaled a shaft 29 which is parallel to shaft 10, the front of the shaft carrying buffing or polishing wheels 30 and 30'. Collars 31 and 32 support a bridge frame 33 which at its rear end has a sleeve 34 for receiving a slide bar 35 to which it may be adjustably secured by means of a set screw 36. The front end of this bar slides in opening 37 in bearing frame 28, while the rear end bears in a frame 38 carried at the upper end of bracket 13, a cam roller 39 on the bar cooperating with a heart cam 40 mounted on shaft 41, as best shown in Figs. 3 and 4. The other end of this shaft carries a worm wheel 42 engaging a worm 43 mounted in bearing lugs 44 and 45 extending from the frame 38. The outer end of the worm mounts a driving pulley 46 which may be driven from any source. A tension spring 47 connects between the collar 34 and the frame 38 and tends to hold the cam roller at all times against the cam. The coöperation of the cam wheel and the spring upon driving of the pulley will cause longitudinal reciprocation of the bar 35 and of the bridge frame 33 connected with collars 31 and 32 which are prevented from moving longitudinally on shaft 29 and, therefore, rotation of the pulley will result in longitudinal reciprocation of shaft 29 on which the buffing wheels 30 and 30' are rigidly mounted. Thus upon simultaneous operation of shafts 10 and 35, the carrier frame will be longitudinally reciprocated and the buffing wheels transversely reciprocated.

Referring to Figs. 1, 5, and 6 to 9, the carrier frame blocks 6, 7 and 8, each have an upwardly extending bearing lug 48, for journaling a shaft 49 whose section 50 between the intermediate and right end carriage blocks is square. To the left end of the shaft 49 a cam arm 51 is rigidly secured at its rear end and terminates in a cam roller 52, as best shown in Figs. 5 and 6. This cam arm has a depending bearing lug 53 near its front end for journaling one end of a shaft 54 extending parallel to shaft 49. Secured at their lower ends to the shaft 54 at the sides of the lug 53 are arms 55 and 56 carrying at their upper ends a head stock barrel 57 through which passes a spindle 58 for receiving one end of an object 59 to be buffed or polished.

Referring particularly to Fig. 9, a supporting bar or frame 60 extends forwardly from the shaft 49 and parallel to the cam arm 51, this arm 60 being adapted for adjustable application to the shaft 49 by means of a clamping plate 61 secured by screws 62, the arm 60 being, therefore, adapted for longitudinal adjustment along the squared section 50 of shaft 49. This arm also has a depending lug 63 for journaling the right end of shaft 54, and engaging this shaft at their lower ends are the arms 64 and 65 which support at their upper ends a tail stock barrel in which is a spindle 67 for engaging the other end of the object 59 to be buffed, a spring 68 within the barrel tending to hold the spindle in engagement with the object. In order that the shaft 54 may rotate in the lugs 53 and 63 and that the head and tail stock frames may be prevented from relative rotation on said shaft, the shaft is preferably square, and bushings 69 and 70 provided, respectively, for the lugs 53 and 63. The head and tail stock frames are, therefore, rotatably locked to the shaft, but the tail stock frame can move longitudinally on said shaft upon adjustment of the supporting frame 60 along the shaft 49. As best shown in Fig. 1, a link 71 is rigidly secured to the shaft 49 and receives the cylindrical end 72 of the shaft 54, said shaft being free to rotate in said link.

At the extreme right end of shaft 54 is secured a collar 73 which secures one end of a spring 74 whose other end is secured to the link 71, this spring having a tendency to rotate the shaft 54 in a counter-clockwise direction in Figs. 8 and 9 or in a clockwise direction when Figs. 6 and 7 are referred to. In other words the spring tends to rotate the shaft 54 and the head and tail stock frames carried thereby so that the object held between the head and tail stock frames will be in the range of the front

buffing wheel as illustrated in dotted line Fig. 6. From the head stock barrel a stop lug 75 extends for engaging the abutment 76 on cam lever 51, when the head stock frame is in the front position referred to. Similarly the tail stock frame has a stop lug 77 for engaging the abutment end 78 of the arm 60. As will be shown later, mechanism is provided for holding the object supporting frames in a rearward position in which the object is within the range of the rear buffing wheel and in this position the stop lugs 75 and 77 rest against abutment lugs 79 and 80, respectively, as shown in Figs. 6 to 9. Referring to Figs. 1 and 5 a spring 81 connects between the intermediate carrier block 8 and a collar 82 secured to shaft 49, this spring tending to rotate shaft 49 in a clock-wise direction (looking at Figs. 8 and 9), thus to raise the shaft 54 and the frames carried thereby to hold the object in engagement with the particular buffing wheel with which it is associated. A spring 83 similarly applied at the right end of shaft 49 may assist spring 81. The upward rotation caused by these springs may be adjusted by means of a set screw 84 supported in bracket 85 extending from the carrier block 6 and engaging with the top of the cam arm 51. The pressure of the object against the wheel can thus be adjusted.

In order to protect the machine parts from the buffing wheels, provision is made to lower the shaft 54 when the end of the object has passed the wheel. This is accomplished at the proper time by engagement of the cam roller 52 with a cam rail 86 carried from the front vertical wall 87 of a bracket 88 extending forwardly from shelf 15. The distance between the point of spindle 58 and the roller 52 is such that the roller will engage the cam rail just after the end of the object 59 has been passed by the buffing wheel, the head and tail stocks with the object between them being then deflected downwardly so that the head stock frame and parts will be out of range of the wheel as the carriage travels to the right end of its path. In this machine it is unnecessary to provide deflecting mechanism for protecting the tail stock mechanism as the reciprocal direction will be changed immediately after the object leaves the buffing wheel before the buffing wheel can engage the tail stock parts, as will be shown more fully later.

As best shown in Figs. 2 and 5, a structure is rotatably mounted on the left end of shaft 54 between a collar 89 and the arm 55 of the head stock frame, this structure comprising a star wheel 90, a sprocket 91 and a ratchet wheel 92. The star wheel has a plurality of arms 93, each carrying at its end a roller 94. The sprocket wheel 91 transmits through a chain 95 to a sprocket wheel 96 secured to the end of the head stock spindle 58, whereby the rotation of the star wheel will cause rotation of this spindle and of the object 59. The ratchet wheel 92 coöperates with a pawl pivoted to the arm 55 so that the star wheel may rotate in clock-wise direction looking from the left end of the machine, but will be prevented from rotating in the opposite direction.

On the horizontal shelf 98 supported by bracket 88 is mounted a block 99 having a lateral extension 100 over the left side of the shelf 98 to which extension is pivoted a cam rail 101 extending diagonally upwardly toward the left and in position so that its lower surface will be engaged by rollers of the star wheel as the carriage travels toward the right, this engagement causing clock-wise rotation of the star wheel. The rear end of the block 99 is shaped to form an arcular beveled cam surface 102 which forms a continuation of the cam rail 101 to prolong the rotation of the star wheel so that the net angle of rotation of the star wheel will be equal to the radial angle between the arms of the star wheel. The position of this last described cam surface mechanism, with reference to the upper cam rail 86, is such that the star wheel will be rotated during the time that the object has been deflected away from the buffing wheel by engagement of roller 52 with the cam rail 86. Thus immediately after the left end of the object travels beyond the buffing wheel, the cam mechanism comes into play to bodily withdraw the object from the range of the wheel and to rotate the object to present a fresh longitudinal surface to be acted upon by the buffing wheel when the carriage again travels toward the left. When the carriage begins its travel toward the left the roller 52 will leave the cam rail 86 so that the object is brought into range of the buffing wheel, and the star wheel upon this return movement will engage the cam rail 101, but this cam rail will merely rotate downwardly against the force of spring 103 which connects between the arm 104 extending outwardly from the cam rail and the extension 100. Counter-clock-wise rotation of the star wheel will be prevented by the pawl and ratchet mechanism already referred to.

The mechanism for controlling the movement of the supporting mechanism from the range of one buffing wheel to that of the other and for automatically stopping the machine when the buffing operation has been entirely completed, is best shown in Figs. 3, 4, 5 and 8 to 11. Journaled in a boss 105 extending toward the right from the standard 24 is a shaft 106 to whose inner end is secured a ratchet wheel 107 and a notch plate 108 having a plurality of peripheral notches

109. Rotationally mounted on said shaft between the ratchet wheel and the boss is a pawl plate 110 pivoting a pawl 111 which coöperates with the ratchet wheel to cause rotation thereof upon counter-clock-wise rotation of the pawl plate. A spring 112 connects with the pawl plate and tends to rotate said plate in a clock-wise direction. An extension 113 on the pawl plate carries a forwardly extending arm 114 which at its end pivots a cam roller 115. As best shown in Fig. 5, a longitudinal bar 116 is supported from the standard 5 and at its ends supports bearings 117 and 118, respectively, in which bearings a shaft 119 may reciprocate. Rigidly secured to this shaft is a block 120 at whose upper end is secured a cam bar 121, presenting upper and lower horizontal cam surfaces 122 and 123 to coöperate with the roller 115 carried by the pawl plate 110. At the left end is adjustably secured a stop 124 which engages with the block 120 when the carriage approaches the right end of its stroke, and the end of arm 60 (Fig. 9) forms a stop 125 for engaging the other side of the block 120 when the carriage approaches the left end of its stroke. The adjustment is such that for each reciprocation of the carriage, the shaft 119 will receive a reciprocation to engage the cam bar 121 with the cam roller 115. When the cam bar 121 moves to the right from the position shown in the drawings the cam roller will drop to the lower surface 123 thus allowing clock-wise rotation of the pawl plate by the spring 112, and when the cam bar again moves to the left the roller is returned to the upper cam surface 122 to rotate the pawl plate and to carry therewith the ratchet wheel and notch plate.

On a stud 126 extending toward the right from the standard 5 is pivoted a forwardly extending arm 127 having a front longitudinally extended shelf 128. A spring 129 connects between the arm 127 and the standard and tends to swing the arm upwardly. An arm 130 extends to the right and upwardly from the main arm 127, its end pivoting a roller 131 which is held against the periphery of the notch wheel 108 by the force of spring 129. As best shown in Figs. 10 and 12, a cam block 132 is formed on the right end of the shelf 128, the right end of the block being beveled downwardly as shown, and the left end being wedge shaped to form a cam surface 133. The block 132 is below the line of travel of a tooth 134 extending downwardly from the block 120, and so long as the roller 131 can engage only in the shallow notches 109 of the notch plate 108, the arm 130 cannot rise far enough to cause engagement between the cam block and the tooth 134. However, as soon as a deeper notch 109′ receives the roller, the arm 127 will be raised up far enough so that the tooth will strike the cam surface 133 to be deflected forwardly and to cause corresponding rotation of the shaft 119. The purpose of this rotation will appear later.

Extending upwardly from the bar 116 to the left of the notch wheel is a lug 134 which pivots the left end of a cam lever 135 carrying at its front end a cam roller 136, and pivoting at an intermediate point a cam roller 137 which engages the periphery of the notch wheel. Pivoted on shaft 49, near the left end thereof, is a locking lever 138, best shown in Figs. 6—7—8—14 and 15. The front end of this lever is rounded and has a locking tooth 139 for engaging a pin 140 extending from the arm 56 of the head stock frame. The locking lever pivots on the shaft 49 between collars 141 and 142, and a spring 143 encircling the shaft between the collars is secured at its inner end to one of the collars and at its outer end engages the locking lever to hold the lever in the upper position, as shown in Fig. 8. The end of the locking lever to the rear of shaft 49 terminates in a cross piece 144 whose end face is in the path of the roller 136 pivoted to the end of the cam lever 135. The ends of the top edge of the cross piece are beveled downwardly and when the roller 137 engages in the shallow notches of the notch wheel, the roller 136 will engage the top edge of the cross piece and will ride over the cross piece, resulting merely in raising of the arm 135. When, however, the roller 137 engages the deeper notch 109′, the lever 135 drops sufficiently so that the roller 136 will travel along the lower surface of the cross piece and will raise the cross piece to rotate the locking arm to cause its front end to swing downwardly, to disengage its locking tooth from the pin 140, thereby releasing the head stock frame and consequently the shaft 54, so that the spring 74, already referred to, can rotate the shaft, and the head and tail stocks can return to their position below the front buffing wheel. Star wheel 90 has seven arms and the notch wheel 108 has thirteen shallow notches and one deep notch.

As best shown in Figs. 3—6—16 and 17, the forwardly extending arm of the bell crank clutch lever terminates in a head 141′ whose outer edge 142′ is rounded and has a rectangular notch 143′. A depending pin 144′ is adjustably secured to the shaft 119 by a set screw 145, and this pin, during operation of the machine, engages in the notch 143′ and is held therein by the leaf spring 146 whose base is secured to the head 141 and whose end extends adjacent the notch 143.

As best shown in Figs. 2—4 and 5, means are provided for supporting the shaft 54 at an intermediate point to prevent flexure

thereof. This means comprises a bushing 148 receiving the shaft and journaled in a bearing sleeve 149 carried at the upper end of a rod 150 having sliding engagement in lugs 151 and 152 extending from a bracket 153, extending from the standard 5. A spring 154 encircles the rod between the lower lug 152 and a collar 155 on the rod, the spring tending to force the bushing upwardly to take up any sag or flexure of shaft 54.

The operation of the machine can now be readily understood. When the machine is in a normal rest position the deep notch 109′ of the notch wheel 108 receives the cam roller 121 (see Fig. 10). The traveling carriage is at the extreme right of the machine, the head and tail stocks being held in outer position by the spring 74. Also during this rest position, the clutch controlling pin 144′ is out of the notch 143′. The operator inserts between the head and tail stocks the object to be treated and then swings back the object supporting frame about the shaft 54 to carry the object to its rear position within the range of the rear buffing wheel 30′, the pin 140 engaging the rounded end of the locking arm 138 to deflect said arm which is then returned to its upper position by its spring 143 so that its tooth 139 receives the pin to lock the object carrying frame in its rear position. The operator then connects the pulley 46 to set the buffing wheel reciprocating mechanism in operation and then pulls cord 147 to rotate the clutch lever 22 to clutch driving pulley 20 to shaft 10 whereupon the carriage begins its reciprocation. When the carriage has reached the left end of its stroke the block 120 will have been engaged by stop 125 and the cam bar 121 shifted to the left to carry the cam roller 115 from the lower cam surface 123 to the top surface 122 thus having caused a counter-clock-wise advance of the pawl wheel 110 and of the ratchet wheel 107 and notch wheel 108 to carry the deep notch 109′ from the cam roller 131, and to carry the adjacent shallow notch into engagement with the cam roller 137, this causing arm 127 to be deflected downwardly to carry the cam block 132 below the path of tooth 134. Also when the block 120 was shifted to the left the clutch controlling pin 144′ extending from shaft 119 was received by the end of spring 146, and guided into notch 143′ and into engagement with the clutch lever, the clutch lever being then carried with the pin until the clutch mechanism has disconnected driving pulley 20 and has connected driving pulley 19 with shaft 10. The carriage will now travel to the right, and in the drawings the carriage is shown as having completed the greater part of this movement to the right with the stop block 124 just engaging the block 120 As the carriage continues its travel to the right the roller 115 again drops to the lower surface 123 of the cam bar 121 and the pawl wheel is rotated in clock-wise direction by spring 112, the pawl 111 traveling over the ratchet wheel without causing rotation thereof. During this reciprocation the object has been held in engagement with the rear buffing wheel by the force of springs 81 and 83. Immediately after the left end of the object leaves the wheel the roller 52 engages with cam rail 86 to lower the shaft 54 from the position shown in Fig. 6 to the position shown in Fig. 7, and then a roller of the star wheel will engage the cam surfaces 101 and 102 so that the sprocket wheels and chain will rotate to give the object a 1/7 turn so that a fresh surface will be presented to be treated during the next reciprocation. Toward the end of the movement to the right when the stop 124 engages block 120 to shift the shaft 119, the clutch controlling pin 144′ which is in engagement with the clutch lever, will begin to rotate the clutch lever and when the end of the stroke is reached the driving pulley 19 will have become disconnected and the pulley 20 reconnected in service. The carriage will be given five further reciprocations and for each reciprocation the notch wheel will be advanced from one notch to the other and the object given a 1/7 rotational advance. When the carriage has completed its movement to the left during the seventh reciprocation, the deep notch 109′ will have been carried to receive the cam roller 137 on cam arm 135 and the cam arm will drop so that when the roller 52 and star wheel have been actuated the lower surface of cross piece 144 will travel on the cam roller 136 whereupon the locking arm 138 is lowered to release pin 140 and to allow spring 74 to restore the object holding frame to its front position to carry the object within the range of the front buffing wheel as shown by dotted lines Fig. 6. There will now be seven further reciprocations while the object is being treated by the front buffing wheel, each reciprocation being by a 1/7 rotation of the object. After the eighth reciprocation the roller 137 again engages with a shallow notch and the cam arm is raised to its upper normal position. During the movement to the left of the fourteenth reciprocation the deep notch has again moved into position to receive the cam roller 131 whereupon the arm 127 is swung upwardly to bring the cam edge 133 into the path of tooth 134. Now, when the carriage completes its movement to the right the stop 124 will engage the block 120, and pin 134 will be carried along the cam surface 133 to cause counter-clock-wise rotation of shaft 119 (Fig. 6) to withdraw pin

144′ from notch 143′, and this withdrawal occurs at the moment when the clutch lever assumes a neutral position, the result being that the carriage stops. This stopping of the carriage is an indication to the operator that the buffing operation has been completed and he then removes the object. No work or attendance is therefore necessary from the time the operator inserts an object until the entire buffing operation by both wheels has been completed, the machine being entirely automatic in its operation to move the object to the next wheel after treatment by the first wheel. Each reciprocation is automatically accompanied by a rotational advance of the object, and during the buffing operation the wheels are reciprocated transversely so that they will wear evenly. The wheels can be of any nature to give the required treatment. For example the rear wheel could be of coarser material to give a primary treatment and the front wheel could be of finer grade to give the final finish to the object.

My invention should not be limited to the precise construction and arrangement shown and described, as this may be varied within wide limits without departure of the scope of the invention, I, therefore, desire to secure the following claims by Letters Patent.

1. In a buffing machine of the class described, the combination of a plurality of buffing members, means for actuating said members, means for causing a plurality of reciprocations of an object to be buffed, first in the field of one buffing member and then in the field of another buffing member.

2. In a machine of the class described, the combination of a plurality of buffing members, means for actuating said buffing members, means for automatically shifting an object to be buffed from the field of one member to that of the other, and means for causing a plurality of reciprocations of the object in each field before shifting thereof to the next field.

3. In a machine of the class described, the combination of a plurality of buffing members, means for reciprocating the object in the fields of said buffing members, means for locking the object to be given a plurality of reciprocations first in one field, means for releasing the object, and means for shifting the object to the field of another buffing member after release of the object.

4. In a machine of the class described, the combination of a plurality of buffing members, means for automatically shifting an object from field to field of the buffing members to cause said object to be successively treated by said members, and means for indicating when the object has been treated by the last member.

5. In a machine of the class described, the combination of a plurality of buffing wheels, means for shifting an object to be treated from field to field of the wheels to be successively treated thereby, and means for causing bodily movement of said wheels over the object during the buffing operation.

6. In a machine of the class described, the combination of a plurality of buffing wheels, means for automatically shifting the object from field to field of the buffing wheels to be successively treated by said wheels, and means for intermittently rotating said object step by step.

7. In a machine of the class described, the combination of a plurality of buffing wheels, means for automatically shifting the object from field to field of the buffing wheels to be successively treated by said wheels, and means for automatically giving the object a complete step by step rotation during treatment thereof by each wheel.

8. In a machine of the class described, the combination of a plurality of buffing wheels, means for rotating said wheels, means for automatically shifting an object to be treated from field to field of the buffing wheels, means for reciprocating the object when in said fields, and means for causing rotational movement of the object when in said fields.

9. In a buffing machine, the combination of means for reciprocating an object to be buffed, a plurality of buffing wheels, means for rotating said wheels, means for intermittently rotating said object step by step, and means for automatically shifting the object from field to field of said wheels.

10. In a buffing machine, the combination of means for reciprocating an object to be buffed, a plurality of buffing wheels, means for rotating said wheels, means for intermittently rotating said object step by step, means for automatically shifting the object from field to field of the wheels, and means for causing bodily reciprocation of the wheels over the object.

11. In a buffing machine of the class described, the combination of a carriage, means for reciprocating for said carriage, a plurality of buffing wheels mounted over said carriage, means for rotating said buffing wheels, supporting frame work on said carriage and movable relatively thereto, said frame work serving to support an object to be treated by the buffing wheels upon reciprocation of the carriage, and means for automatically moving said frame work to carry the object from the field of one wheel to that of another, whereby the object is successively treated by said wheels.

12. In a buffing machine of the class described, the combination of a carriage, supporting members on said carriage between which an object to be treated is held, a plurality of buffing wheels, means for reciprocating said carriage to carry the object into and out of engagement with said wheels,

means for shifting the supporting members to carry the object from association with one wheel into association with another wheel, and means for rotating the object step by step during reciprocation of the carriage.

13. In a buffing machine, the combination of a carriage, a plurality of buffing wheels adjacent said carriage, means for reciprocating said carriage, supporting members pivoted at one end to said carriage and adapted at their other ends to support an object to be buffed, and means for swinging said supporting members to carry the object from one wheel to the other.

14. In a buffing machine, the combination of a carriage, a plurality of buffing wheels adjacent said carriage, means for reciprocating said carriage, supporting members pivoted at one end of said carriage and adapted at their other ends to support an object to be buffed, means for swinging said supporting members to carry the object from one wheel to the other, means for causing step by step rotation of said object during reciprocation of the carriage, and means for bodily moving the object supporting members during such rotations.

15. In a machine of the class described, the combination of a carriage, means for longitudinally reciprocating said carriage, a plurality of buffing wheels, means for reciprocating said buffing wheels, arms pivoted to said carriage, a head-stock frame pivoted to one of said arms, and a tail-stock frame pivoted to the other arm, the object to be treated being held between said head-stock and tail-stock frames, means for holding said head-stock and tail-stock frames in position with reference to the carriage so that the object will be engaged by the said wheels during reciprocation of the carriage, means for causing rotation of said arms when the wheels reach the end of the object, means for causing an annular advancement of the object when said arms are rotated, and means for swinging said head-stock and tail-stock frames to carry the object from the field of one wheel into the field of another wheel.

16. In a buffing machine of the class described, the combination of a carriage, means for longitudinally reciprocating said carriage, a plurality of buffing wheels, means for rotating said wheels, a pivoted head-stock frame and a pivoted tail-stock frame adapted to travel with said carriage and to support an object to be buffed, means for holding the head-stock and tail-stock frames in position to engage the object with one of said wheels during reciprocation of the carriage, means for automatically swinging said frames to carry the object into position to be engaged by another wheel, and means for automatically stopping the reciprocation after the object has been treated by the last wheel.

17. In a machine of the class described, the combination of a plurality of buffing wheels, a carrier, a clamping jaw frame swingingly pivoted on said carrier and adapted for receiving and holding an object to be buffed, means for reciprocating said carrier to cause a supported object to be carried back and forth through the buffing fields of the buffing wheels, means for positively locking said clamping jaw frame to confine the supported object to the field of one buffing wheel, release means operating after a predetermined interval to release the clamping jaw frame, and means acting upon such release to swing the jaw frame to carry the object into the field of another buffing wheel.

18. In a machine of the class described, the combination of buffing wheels, a carrier, a clamping jaw frame swingingly pivoted on said carrier and adapted to receive and support an object to be buffed, means for causing repeated reciprocation of the carrier and thereby of the object with reference to the buffing wheels, locking mechanism for locking the jaw frame initially in one position to confine the supported object to the field of one buffing wheel, releasing means automatically rendered active at the end of a predetermined number of reciprocations to release the locking mechanism, and means acting upon such release to swing the jaw frame to carry the object into the field of another buffing wheel.

19. In a machine of the class described, the combination of buffing wheels, a carrier, a clamping jaw frame swingingly pivoted on said carrier and adapted to receive and support an object to be buffed, means for causing repeated reciprocation of the carrier and thereby of the object with reference to the buffing wheels, locking mechanism for locking the jaw frame initially in one position to confine the supported object to the field of one buffing wheel, releasing means automatically rendered active at the end of a predetermined number of reciprocations to release the locking mechanism, means acting upon such release to swing the jaw frame to carry the object into the field of another buffing wheel, and means for causing the carrier to come to rest after said object has been given a predetermined number of reciprocations in the field of the other buffing wheel.

20. In a machine of the class described, the combination of buffing wheels, a carrier, a clamping jaw frame swingingly pivoted on said carrier and adapted to receive and support an object to be buffed, means for causing repeated reciprocation of the carrier and thereby of the object with reference to the buffing wheels, locking mechanism for

locking the jaw frame initially in one position to confine the supported object to the field of one buffing wheel, release mechanism for the locking mechanism, pawl and ratchet mechanism controlling the operation of the release mechanism and for causing said release mechanism to become active after a predetermined number of reciprocations of the carrier to release the locking mechanism from the clamping jaw frame, and means acting upon such release to swing the clamping jaw frame to carry the object into the field of another buffing wheel.

21. In a machine of the class described, the combination of buffing wheels, a carrier, a clamping jaw frame swingingly pivoted on said carrier and adapted to receive and support an object to be buffed, means for causing repeated reciprocation of the carrier and thereby of the object with reference to the buffing wheels, locking mechanism for locking the jaw frame initially in one position to confine the supported object to the field of one buffing wheel, release mechanism for the locking mechanism, pawl and ratchet mechanism controlling the operation of the release mechanism and for causing said release mechanism to become active after a predetermined number of reciprocations of the carrier to release the locking mechanism from the clamping jaw frame, means acting upon such release to swing the clamping jaw frame to carry the object into the field of another buffing wheel, and means also controlled by said pawl and ratchet mechanism for causing the carrier to come to rest after a predetermined number of reciprocations of the object in said other buffing field.

Signed by me, this 14th day of July, 1909, at Kenosha, Wis. in the presence of two witnesses.

JOHN F. GAIL.

Witnesses:
J. H. Cantwell, Jr.,
C. E. Hawley.