No. 839,872. PATENTED JAN. 1, 1907.

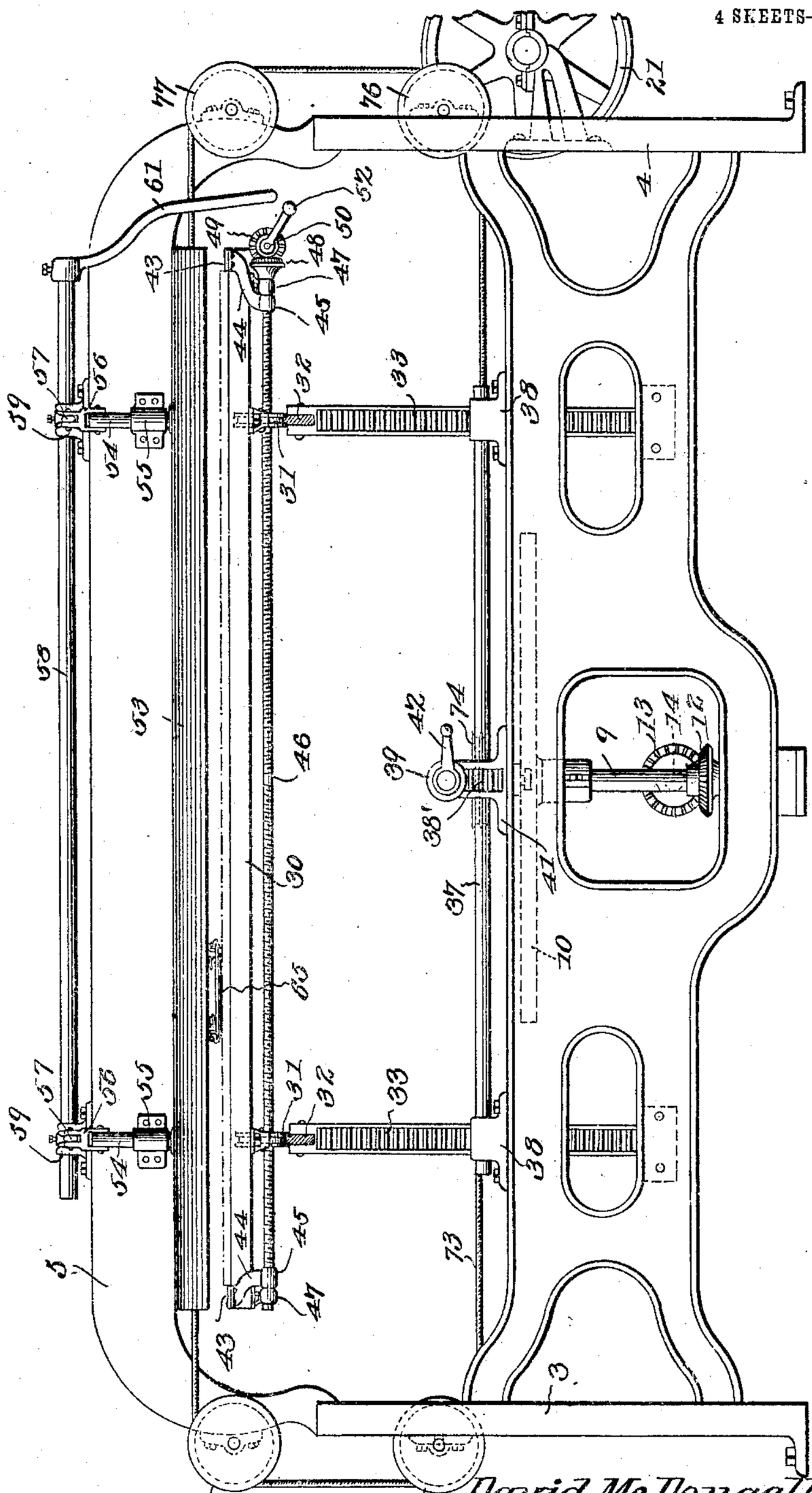
D. McDOUGALL.

SANDPAPERING AND POLISHING MACHINE.

APPLICATION FILED OCT. 24, 1905.

4 SHEETS—SHEET 1.

Fig. 1.



Witnesses

E. F. Stewart

H. C. L. Shepard.

David McDougall, Inventor.

by Church & Co

Attorneys

No. 839,872. PATENTED JAN. 1, 1907.

D. McDOUGALL.

SANDPAPERING AND POLISHING MACHINE.

APPLICATION FILED OCT. 24, 1905.

4 SHEETS—SHEET 2.

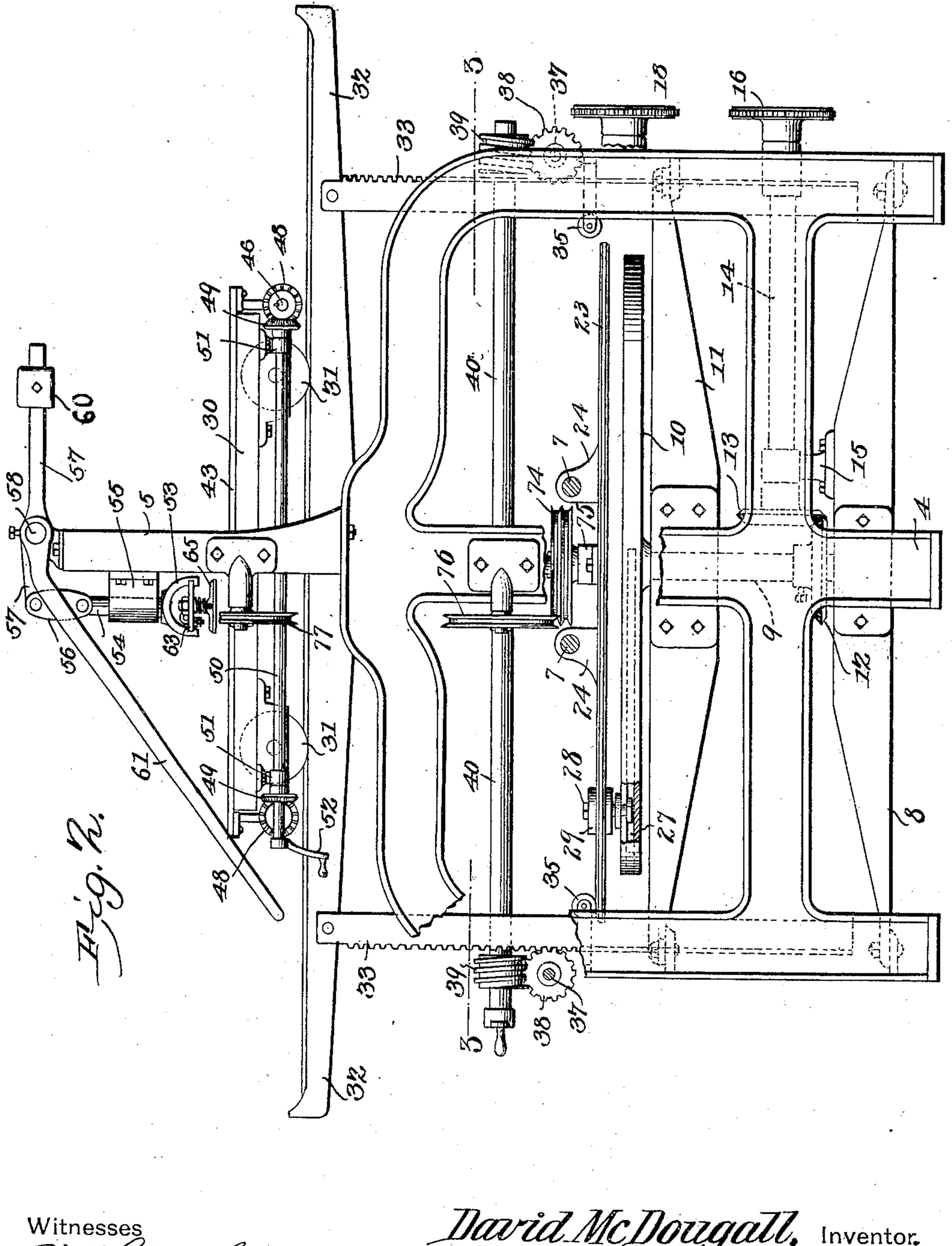


Fig. 2.

Witnesses
E. F. Stewart
H. C. Shepard.

David McDougall, Inventor.
by Crosby & Co
Attorneys

No. 839,872. PATENTED JAN. 1, 1907.

D. McDOUGALL.

SANDPAPERING AND POLISHING MACHINE.

APPLICATION FILED OCT. 24, 1905.

4 SHEETS—SHEET 3.

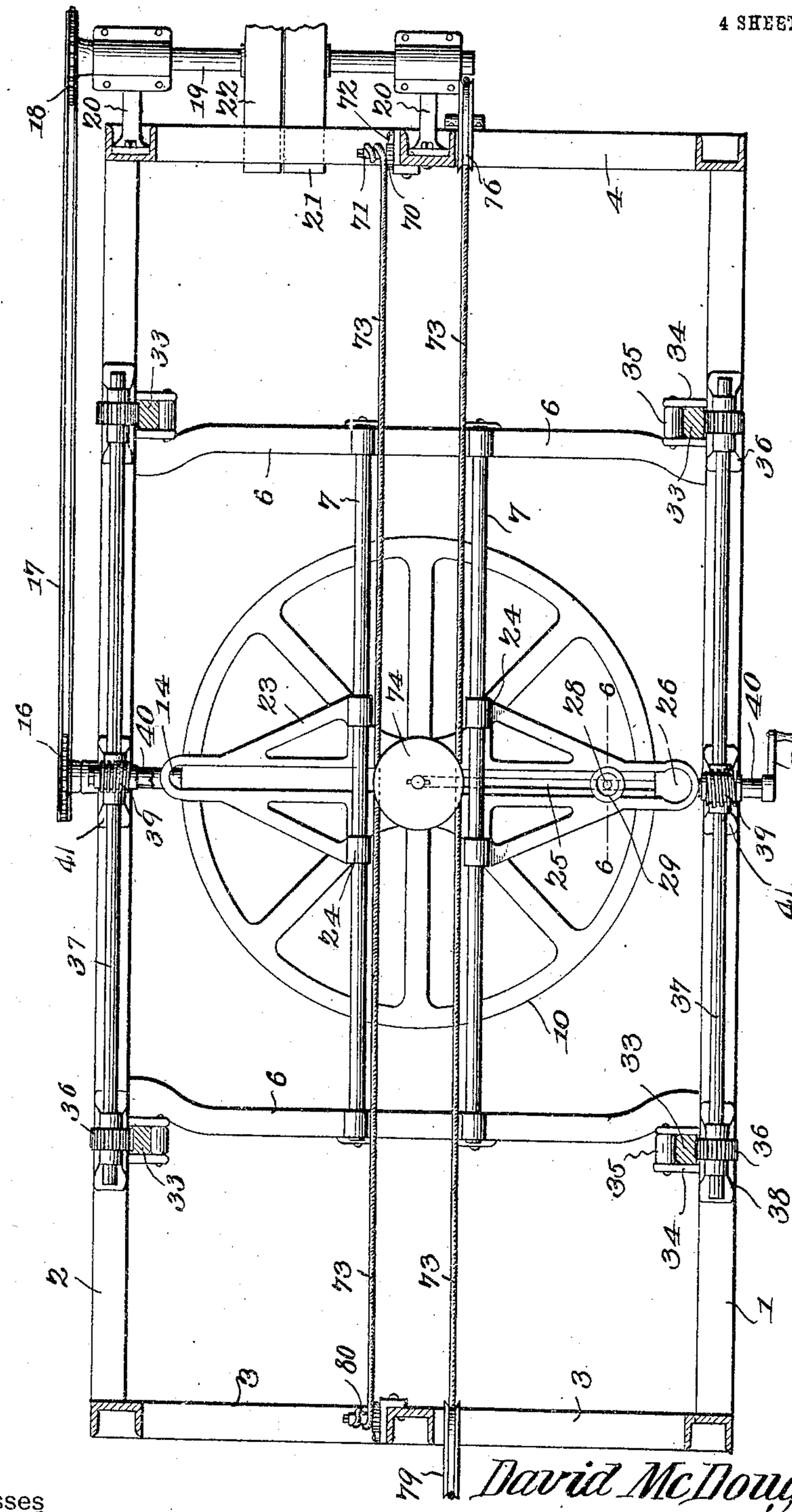


Fig. 3.

Witnesses
E. F. Stewart
H. E. Shepard.

David McDougall,
Inventor.
by Church & Co
Attorneys

No. 839,872. PATENTED JAN. 1, 1907.

D. McDOUGALL.

SANDPAPERING AND POLISHING MACHINE.

APPLICATION FILED OCT. 24, 1905.

4 SHEETS—SHEET 4.

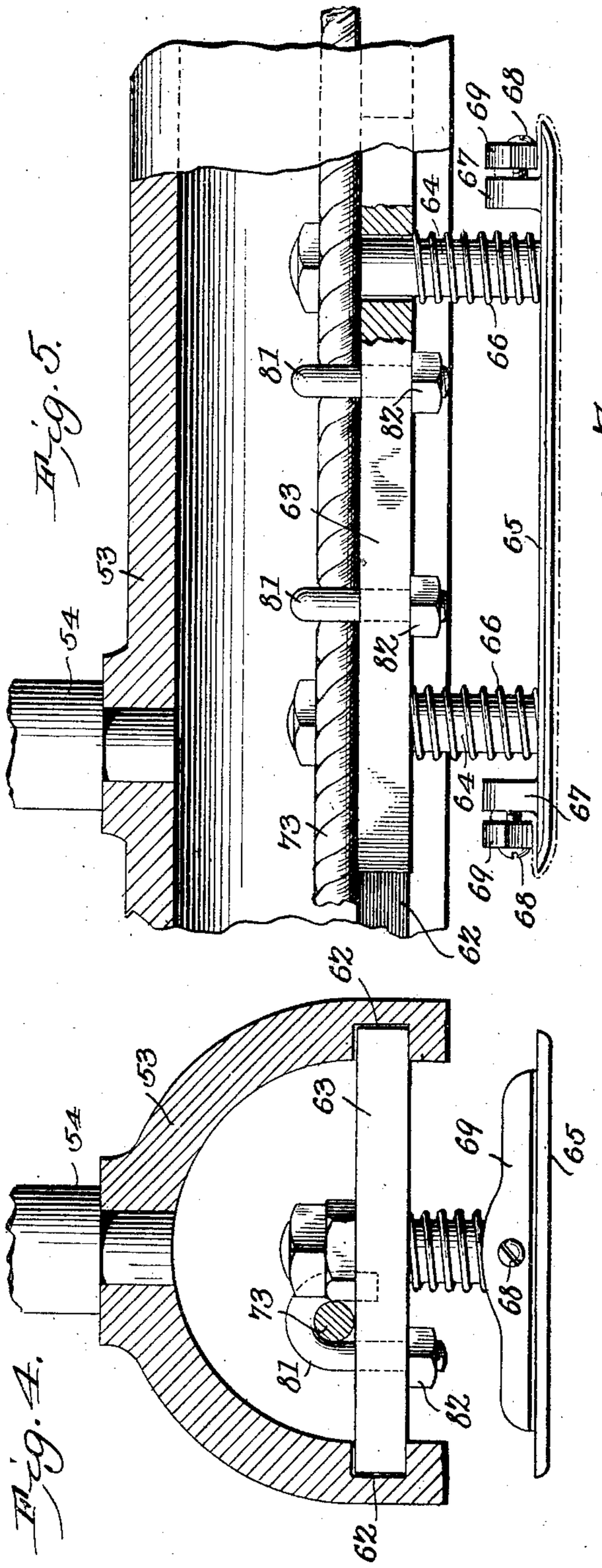


Fig. 5.

Fig. 4.

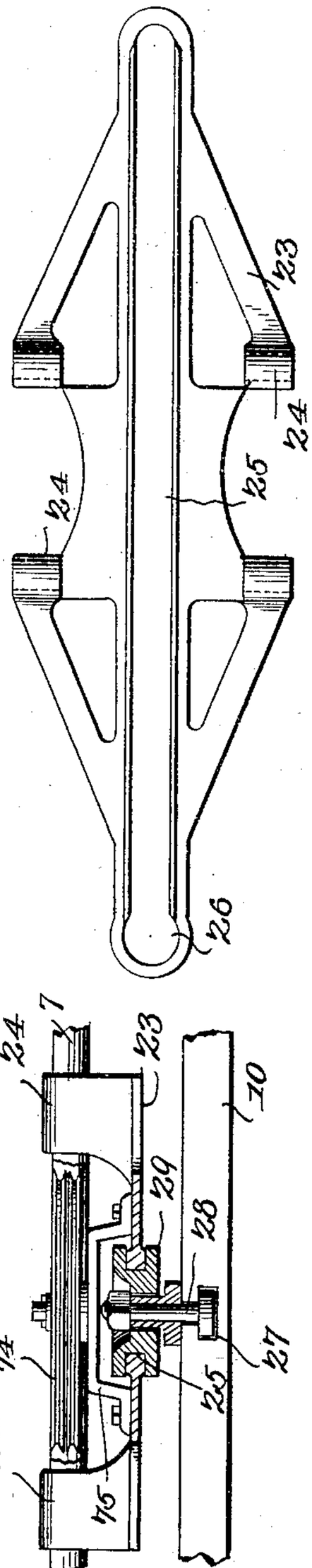


Fig. 7.

Fig. 6.

Witnesses

E. F. Stewart

H. C. Shepard.

David McDougall, Inventor,

by Church & Co

Attorneys

UNITED STATES PATENT OFFICE.

DAVID McDOUGALL, OF FALL RIVER, MASSACHUSETTS.

SANDPAPERING AND POLISHING MACHINE.

No. 839,872. Specification of Letters Patent. Patented Jan. 1, 1907.

Application filed October 24, 1905. Serial No. 284,178.

To all whom it may concern:

Be it known that I, DAVID McDOUGALL, a citizen of the United States, residing at Fall River, in the county of Bristol and State of Massachusetts, have invented a new and useful Sandpapering and Polishing Machine, of which the following is a specification.

This invention relates to abrading and polishing machines, and is primarily designed to provide an improved machine of this character having great capacity and which may be controlled in a very simple and effective manner. It is proposed to impart a reciprocatory movement to the rubbing element from a drive element which rotates continuously in one direction and in this connection to insure a smooth and regular reciprocation of the rubbing element without any breaking or jarring upon the different elements of the machine.

A still further object of the invention is to enable the convenient raising and lowering of the work-table and also the shifting of the latter across the path of the rubbing element, so as to expose all parts of the work thereto.

It is furthermore designed to guide the rubbing element throughout its entire path of movement in a simple and effective manner, so as to insure a uniform treatment of the work and to enable the convenient lifting of the rubbing element from the work in a quick and positive manner without interfering with the operation of the machine.

With these and other objects in view the present invention consists in the combination and arrangement of parts, as will be hereinafter more fully described, shown in the accompanying drawings, and particularly pointed out in the appended claims, it being understood that changes in the form, proportion, size, and minor details may be made within the scope of the claims without departing from the spirit or sacrificing any of the advantages of the invention.

In the drawings, Figure 1 is a side elevation of a sandpapering and polishing machine embodying the features of the present invention. Fig. 2 is an end view thereof with parts of the frame broken away to disclose some of the operating elements. Fig. 3 is a plan section on the line 3 3 of Fig. 2. Fig. 4 is an enlarged detail cross-sectional view of the guide for the rubbing member with the latter mounted therein. Fig. 5 is a longitudinal sectional view of Fig. 4. Fig. 6 is an enlarged sectional view on the line 6 6 of Fig. 3. Fig. 7 is a detail view of the reciprocating cross-head.

Like characters of reference designate corresponding parts in all of the figures of the drawings.

For the support of the operating parts of the present machine there is provided a substantially rectangular frame made up of duplicate spaced longitudinal sides 1 and 2, duplicate ends 3 and 4, and an arch 5, connecting the ends centrally of the fame. In addition to the sides and the ends there is a pair of cross-bars 6, which support a pair of spaced longitudinally-disposed rods 7, which constitute guideways for a reciprocatory cross-head, as will hereinafter appear.

Midway between the ends of the frame and at the bottom thereof there is a cross-bar 8, from the middle of which rises a shaft 9, which carries at its upper end a drive-wheel 10. A cross-bar 11 extends between the opposite sides of the frame immediately beneath the wheel 10 and constitutes a bearing for the upper portion of the shaft 9. Just above the lower cross-bar 8 there is a beveled gear 12 upon the shaft 9, and this gear is in mesh with another beveled gear 13, carried by a substantially horizontal counter-shaft 14, journaled on the side 2 of the frame and in a bearing 15, carried by the cross-bar 8. The counter-shaft 14 projects externally of the frame and carries a pulley or sprocket wheel 16, which is driven by a belt or sprocket-chain 17 from a pulley or sprocket 18 upon the power-shaft 19, which is mounted in suitable brackets 20, carried by the end 4 of the frame. Tight and loose pulleys 21 and 22 are provided upon the power-shaft 19 for the reception of a drive-belt for the purpose of operating the machine.

Located between the wheel 10 and the guide-bars 7 is a cross-head 23, which is disposed transversely of the frame and has two pairs of elevated tubular bearings 24, which slidably embrace the respective guide-bars 7, so as to support the cross-head when it is working back and forth longitudinally of the machine. A longitudinal slot 25 is formed in the cross-head and extends for nearly the entire length thereof, one end of the slot being laterally enlarged, as at 26. The wheel 10 is provided with a flanged or dovetailed groove or guideway 27, in which the lower headed end of an upstanding pin or stub-shaft 28 is slidably mounted. A grooved roller or wheel 29 is rotatably mounted upon

the pin 28 and works back and forth in the slot 25 of the cross-head, the edges of the slot being received within the groove of the roller. By this construction of arrangement when a continuous rotary movement is applied to the wheel 10 through the medium of the upright shaft 9, the counter-shaft 14, and the belt or sprocket-chain 17 the cross-head 23 will be worked back and forth longitudinally of the frame without any appreciable jarring of the machine. This reciprocatory cross-head is made use of as the driving element for reciprocating the rubbing and polishing element, as will hereinafter appear.

The work-table 30 is provided adjacent each end with a pair of grooved wheels 31 to run upon tracks 32, disposed transversely across the machine beneath the arch 5. Each track 32 is supported adjacent each end by an upright rack-bar 33, which works vertically through a bearing-bracket 34, carried by the inner side of the frame and having an antifriction-roller 35 engaging the back of the bar, whereby the teeth of the rack are held in engagement with a pinion 36, carried by a horizontal longitudinally-disposed shaft 37, mounted in suitable bearings 38 upon the adjacent side member of the frame. Upon the middle of each shaft 37 there is a pinion 38′, and in mesh with each pinion is a worm 39, carried by a shaft 40, disposed transversely across the machine and mounted in bearings 41 upon the sides of the frame. A suitable crank-handle 42 is provided upon one end of the shaft 40 for rotating the latter to raise and lower the rack-bars 33, whereby the work-table 30 may be adjustably elevated. By the employment of the worm 39, engaging the pinion 38, the work-table will be supported without the employment of ratchets to prevent reverse rotation of the shaft 40 under the influence of the weight of the table, whereby a very fine adjustment of the table may be obtained.

For the purpose of clamping the work upon the table clamp-bars 43 are employed upon the top of the table adjacent the ends thereof and are capable of being slid sidewise longitudinally of the table. From each end of each clamp-bar there depends a bracket 44, having a tubular internally-threaded bearing 45, receiving the adjacent portion of a threaded rod 46, the adjacent extremity of the latter being journaled in a bracket 47, depending from the under side of the work-table. The ends of the threaded bars 46 at one end of the table are provided with beveled gears 48, which mesh with beveled gears 49, carried by a transverse shaft 50, journaled in bearings 51, depending from the adjacent end of the table. A crank-handle 52 is provided upon one end of the shaft 50 for the purpose of rotating said shaft, which in turn rotates the threaded bars 46. Each bar 46 has its ends reversely threaded, so that when rotated the brackets 44 and clamp-bars 43 will be simultaneously drawn together or separated, so as to clamp and release the work, which is supported upon the top of the table.

Disposed longitudinally above the work-table at one side of the arch 5 is an inverted-U-shaped guideway 53, which is provided adjacent each end with an upstanding stem or rod 54, slidable in a bearing-bracket 55, carried by the adjacent side of the arch 5. The upper end of each stem is pivotally suspended from a link 56, which is in turn pivotally hung from one end of a crank-arm 57, carried by and projecting at opposite sides of a rock-bar 58, which is journaled in bearings 59 upon top of the arch 5. The guideway 53 is normally supported in an elevated position by means of adjacent counterweights 60, which are carried by the crank-arms 57. A crank-handle 61 is provided upon one end of the rock-bar 58 for the purpose of rocking the bar against the action of the tension device formed by the weights 60.

As best indicated in Figs. 4 and 5 of the drawings, it will be noted that the inner walls of the guide 53 are provided with corresponding longitudinal grooves or guideways 62, in which works a plate 63, constituting the body of the rubbing element. This plate or body is loosely pierced adjacent its ends by headed stems or pins 64, which carry a plate 65 at their lower ends and are embraced by helical springs 66, bearing against the top of the plate 65 and the under side of the body 63, so as to yieldably hold the plate 65 at its lower limit. Extending transversely across the top of the plate 65, at each end thereof, is an upstanding flange or abutment 67, which carries an adjustable threaded fastening 68, loosely piercing a clamping element 69, whereby an abrading or polishing element may be secured flat against the under side of the plate 65, as indicated in Fig. 5, by having its ends folded inwardly across the top of the plate and then clamped between the abutments 67 and the clamping elements 69. When the abrading or polishing element has become worn, it may of course be readily replaced without removing the rubbing element from its guide.

As hereinbefore indicated, it is proposed to drive the rubbing element from the reciprocatory cross-head 23, which is accomplished in the following manner: Upon reference to Fig. 3 of the drawings it will be seen that a ratchet-disk 170 is mounted upon the end 4 of the frame about midway between the sides of the frame, said ratchet having a shaft 71 projecting at one side thereof and having a non-circular outer terminal adapted for the reception of a crank-handle or wrench for rotating the shaft. A suitable dog 72 engages the ratchet in the usual manner. One end portion 73 of a cable is connected to and

wound upon the stub-shaft 71, from which it extends inwardly and embraces a pulley 74, rotatably mounted upon a bracket 75, carried by the cross-head 23 and arching over the slot 25. This pulley, as clearly shown in Fig. 6 of the drawings, is provided with upper and lower annular grooves, and that portion of the cable which leads from the stub-shaft 71 is received within the upper groove of the pulley and then returns to the end 4 of the frame, where it passes upwardly around a groove-pulley 76, thence over an upper pulley 77 upon the arch, and thence through the guide 53 and downwardly across upward and lower pulleys 78 and 79 upon the end 3 of the frame. From the pulley 79 the cable extends inwardly and passes around the lower groove of the pulley 74 and thence outwardly to a tension device 80, carried by the end 3 of the frame, and similar to the tension device 70 hereinbefore described. When the wheel 10 is in motion, the cross-head 23 will of course be reciprocated, and as the pulley 74 reciprocates with the cross-head 23 said pulley will work the intermediate portion of the cable back and forth, and thereby reciprocate the rubbing member which is connected to the cable, as shown in Figs. 4 and 5. A portion of the cable 73 lies upon the top of the slide 63 and is connected thereto by means of a pair of hooked bolts 81, which have their stem portions loosely piercing the slides and their hooks embracing the cable, there being nuts 82, fitted to the stems and bear against the under side of the slide for the purpose of drawing the hooks down snugly against the cable. As indicated in Fig. 4, it will be noted that the extremity of each hook is received within a seat or recess in the top of the slide 63 to prevent turning of the bolt.

In practice the work is placed upon the table 30 and held thereon by the work-clamp, as hereinbefore described, whereupon the table is elevated into close proximity with the rubbing element by manipulation of the crank-handle 42. The drive-belt is then shifted to the fast pulley upon the shaft 19, which sets the machine in operation, with the wheel 10 rotating continuously in one direction and the cross-head 23 reciprocating longitudinally of the machine, the rubbing element of course being reciprocated through the medium of the cable, which connects it with the cross-head. By pressing downwardly upon the lever or handle 61 the guide 53 is depressed until the rubbing element comes into engagement with the work, upon which it will be reciprocated in a straight line. The entire surface of the work is of course treated by shifting the work-table back and forth upon the tracks 32. The spring-pressed shoe 65 is yieldable, so as to accommodate the same to any irregularities in the surface of the work and to avoid jarring of the machine. The pressure of the rubbing element against the work may be regulated by the pressure applied to the crank-handle 61, and the rubbing element will be promptly lifted from the work when the lever is released by reason of the action of the counterweight 60. Furthermore, the rubbing element is guided in a true straight line by the guide 53. It is of course important that the rubbing-shoe be reciprocated at a high rate of speed, and this is accomplished by having the length of the guideway 25 in the cross-head equal to one-half of the greatest length of play of the rubbing-shoe, and as the doubled or bight portion of the cable reciprocates with the cross-head 23 the cable portion, which is attached to the rubbing element, moves through twice the space traveled by the cross-head, and the rubbing-shoe therefore moves twice as fast as the cross-head. The change in direction of movement of the cross-head 23 and the rubbing-shoe is accomplished in a very simple and efficient manner without any jarring of the machine, whereby the running of the latter is smooth and regular, and there is little or no wear and tear upon the machine by reason of the change in direction of movement of the cross-head and rubbing-shoe.

Having thus described the invention, what is claimed is—

1. In a machine of the class described, the combination of a work-table, a guide, a reciprocatory rubbing element working upon the guide, a tension device capable of moving the guide away from the work-table, a hand-lever for moving the guide toward the work-table against the action of the tension device, and yielding means disposed between the hand-lever and the reciprocatory rubbing element so that the latter will be pressed yieldingly against the work-table.

2. In a machine of the class described, the combination of a work-table, a guide, a rubbing element working upon the guide, a tension device consisting of a counterbalance-weight capable of moving the guide away from the table, means for moving the guide toward the table against the action of the tension device, and yielding means disposed between the first-mentioned means and the rubbing element, said yielding means consisting of a spring mounted between the rubbing element and the guide.

3. In a machine of the class described, the combination with a frame, of a work-table, a rock-bar supported above the work-table in substantial parallelism therewith, crank-arms carried by the rock-bar, links hung from the crank-arms, an inverted substantially semitubular guide having an open bottom, stems rising from the guide and hung from the links, a guide upon the frame and engaging the stems, a tension device acting upon the rock-bar to hold the semitubular guide elevated, means for rocking the bar to

raise and lower the semitubular guide, and a reciprocatory rubbing element working in the semitubular guide and exposed through the open bottom thereof to the work-table.

4. In a machine of the class described, the combination of a work-table, an inverted substantially semitubular guide having internal guideways, a slide working in the guideways, a stem slidably piercing the slide, a shoe carried by the stem, and a spring interposed between the shoe and the slide to yieldably project the latter through the open bottom of the guide.

5. In a machine of the class described, a substantially semitubular guide having an internal guideway, a reciprocating drive element working within the guide, a slide working in the guideway and connected to the drive element, and a rubbing-shoe carried by the slide and projected through the open side of the guide.

6. In a machine of the class described, a substantially semitubular guide having an internal guideway, a drive element working in the guide, a slide working in the guideway, a hooked bolt carried by the slide and embracing the drive element, and a rubbing-shoe carried by the slide and projecting through the open side of the guide.

7. In a machine of the class described, the combination with a reciprocatory rubbing element, of means for driving the same comprising a reciprocatory actuator carrying a pulley, and a cable having its ends fixed, the middle portion of the cable being connected to the rubbing element, and the portions of the cable between the rubbing element and its fixed ends embracing the pulley in opposite directions.

8. In a machine of the class described, the combination with a frame and a reciprocatory rubbing element, of a reciprocatory actuator having a pulley, guides upon the frame at opposite sides of the actuator, and a cable having its ends fixed to the frame, the middle portion of the cable being secured to the rubbing element, one portion of the cable extending away from the rubbing element to one of the guides and thence around the pulley to its point of connection with the frame, the other portion of the cable extending in the opposite direction from the rubbing element through the other guide and thence around the pulley in the opposite direction to its point of connection with the frame.

9. In a machine of the class described, the combination with a frame, of a reciprocatory rubbing element, a reciprocating actuator mounted below the rubbing element, guides upon opposite ends of the frame, a guide upon the actuator, and a cable having one end fixed to the frame from which it passes around the guide on the actuator to one of the guides on the frame and thence to the rubbing element, the other end of the cable being fixed to the other end of the frame from which it passes around the guide of the actuator in the opposite direction to the other guide on the frame and thence to the rubbing element.

10. In a machine of the class described, the combination with a reciprocatory rubbing element, of a rotary drive element having a radial guideway, a reciprocatory actuator having a guideway transverse to its path of movement, a connecting element slidable in the two guideways, and a drive connection between the actuator and the rubbing element.

11. In a machine of the class described, the combination with a frame, of a reciprocatory rubbing element, a rotary drive element having a radial guideway, a pair of spaced guide-bars, a reciprocatory actuator having bearings slidably engaging the bars and also provided with a guideway transverse to the path of movement of the actuator, a connecting element slidable in the two guideways, and a connection between the actuator and the rubbing element.

12. In a machine of the class described, the combination with a frame and a reciprocatory rubbing element, of a rotary drive element having a radial guideway, a reciprocatory actuator provided with a guideway transverse to its path of movement, a connecting element slidable in the two guideways, a pulley mounted upon the actuator, guides at opposite ends of the frame, and a cable having one end fixed to one end of the frame from which it passes around the pulley back to said end of the frame and around the adjacent guide to the rubbing element, the other end of the cable being fixed to the other end of the frame from which it passes around the pulley in the opposite direction back to said other end of the frame and around the adjacent guide to the rubbing element.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

DAVID McDOUGALL.

Witnesses:
WILLIAM S. HOPKINS,
WILLIAM CRAWFORD, Jr.