

May 22, 1934.

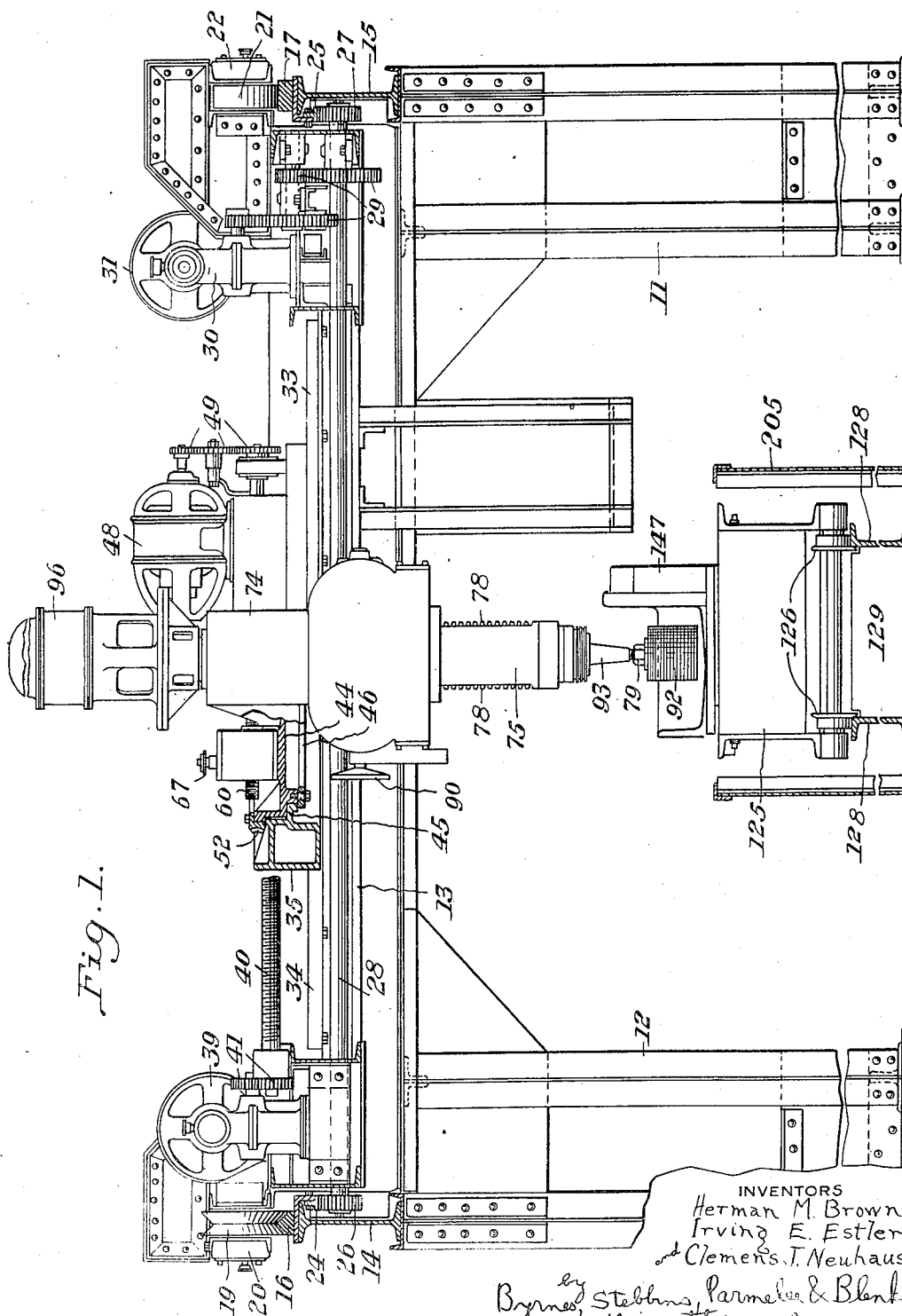
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1,959,900

POLISHING MACHINE

Filed Sept. 3, 1931

12 Sheets-Sheet 1



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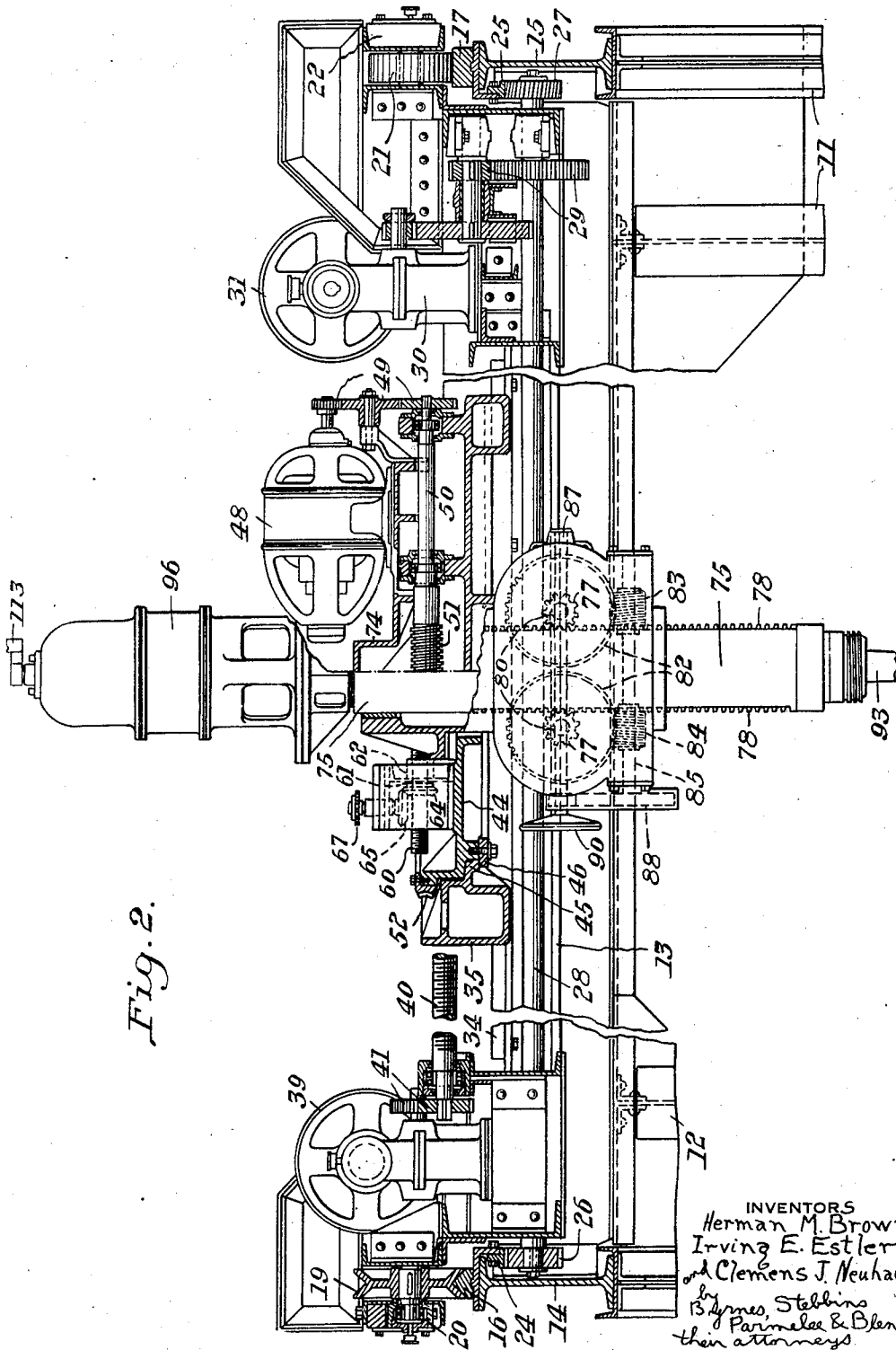
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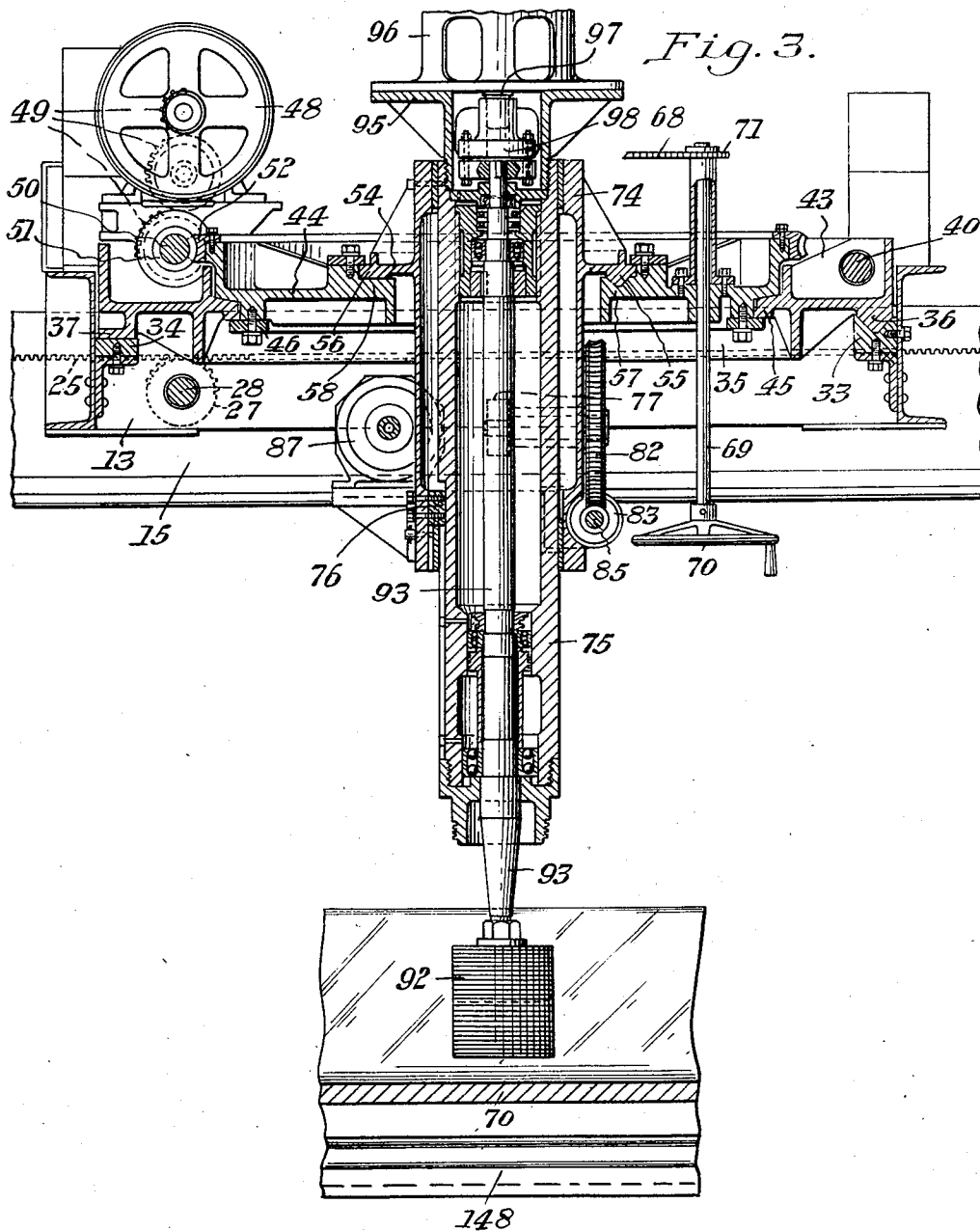
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12 Sheets-Sheet 3



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POLISHING MACHINE

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12 Sheets-Sheet 4

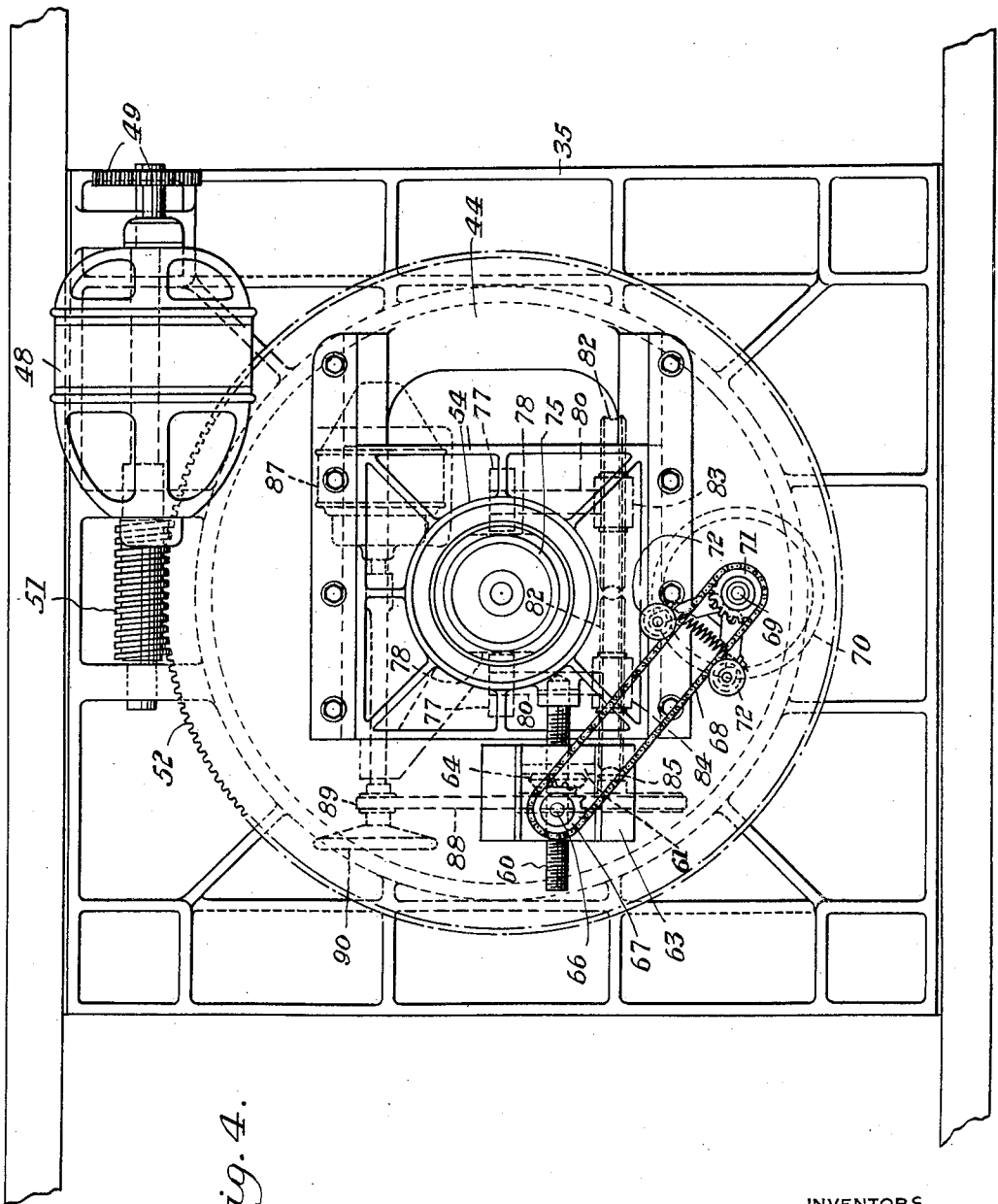


Fig. 4.

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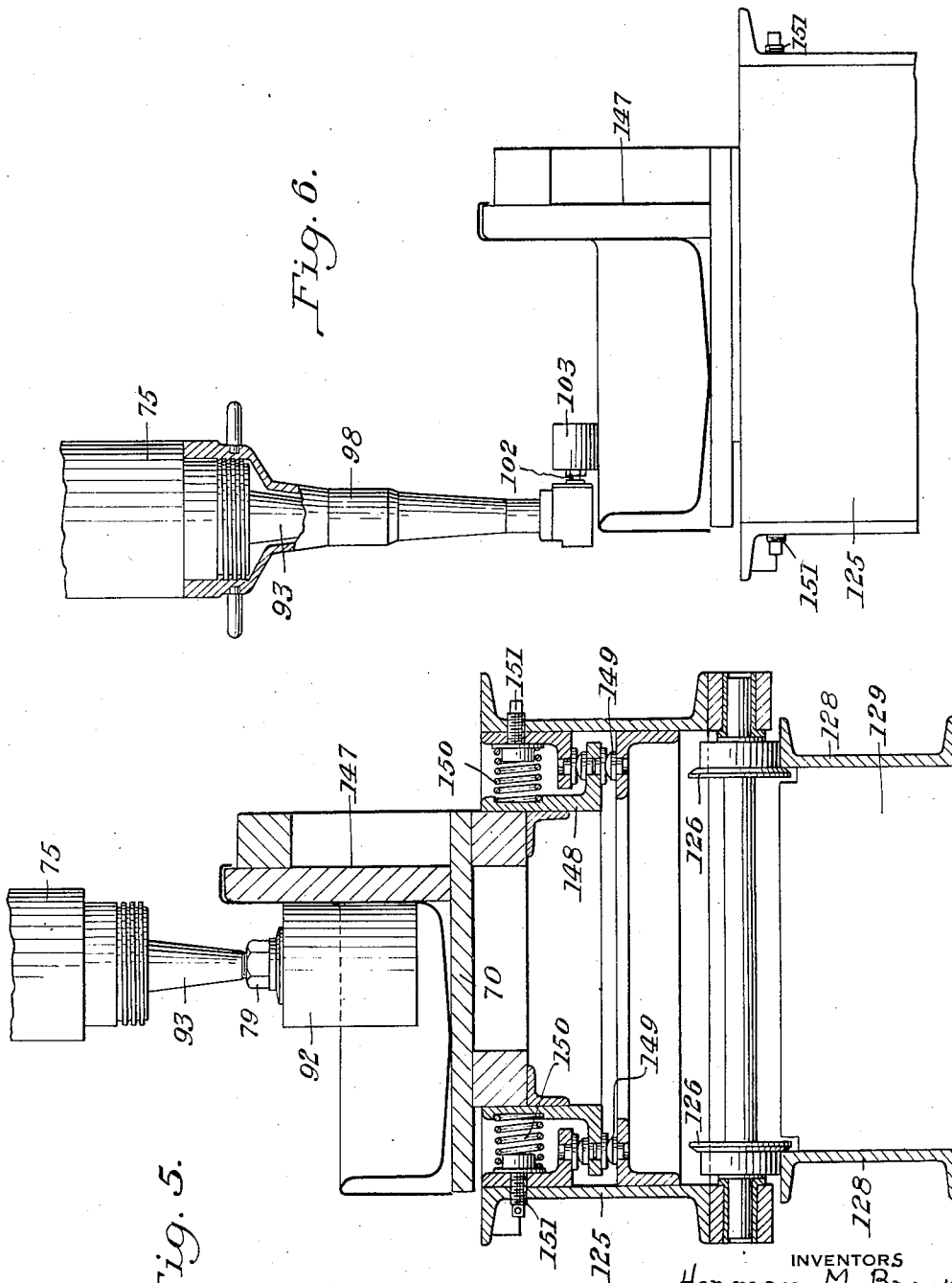


Fig. 5.

Fig. 6.

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Fig. 8.

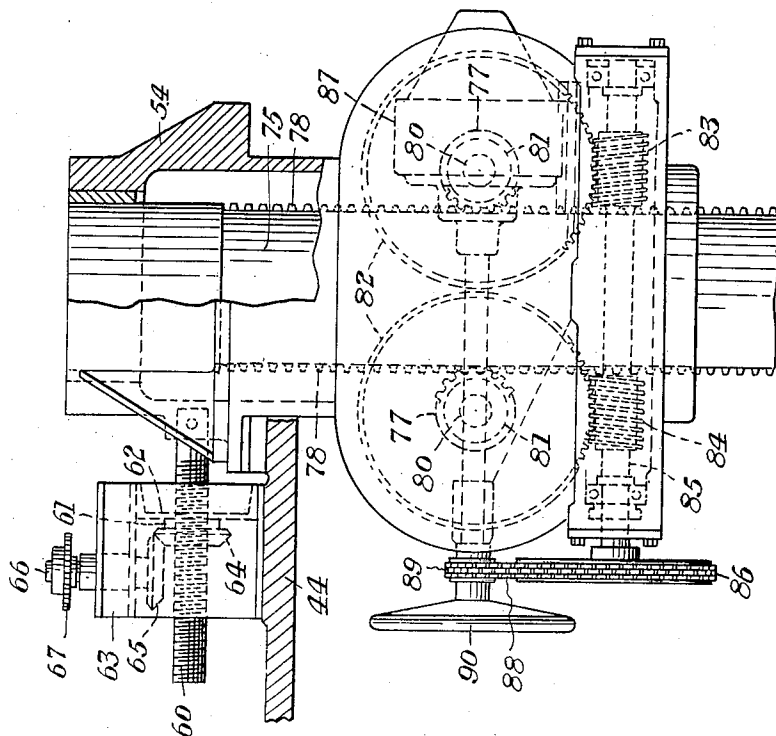
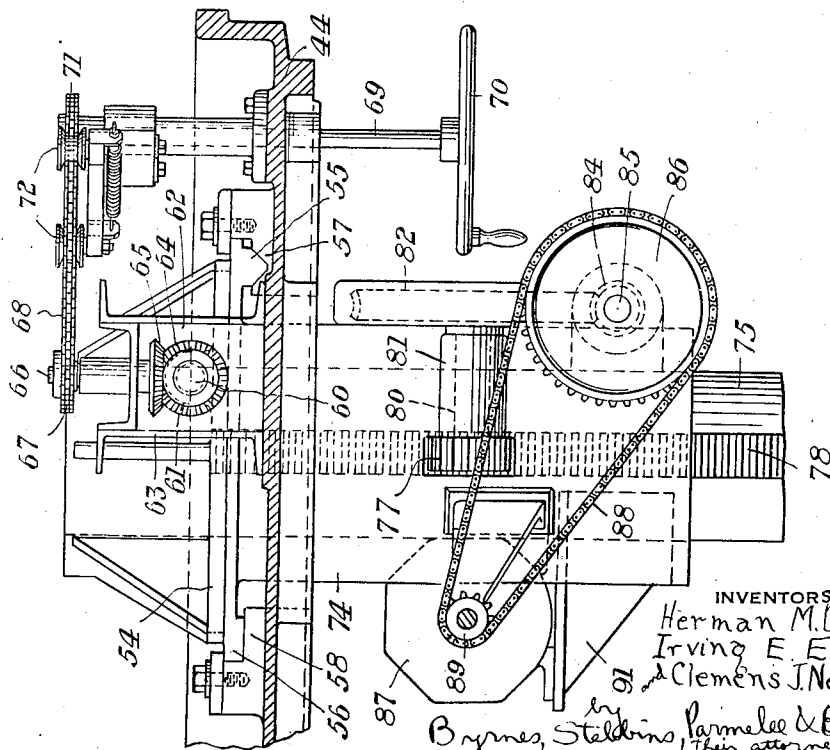


Fig. 7.



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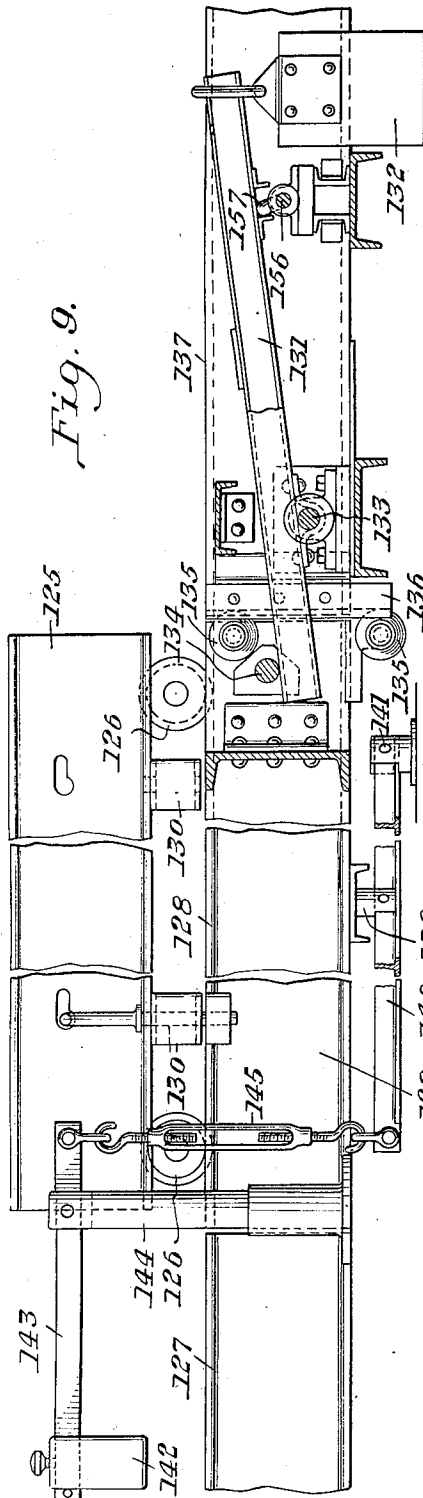
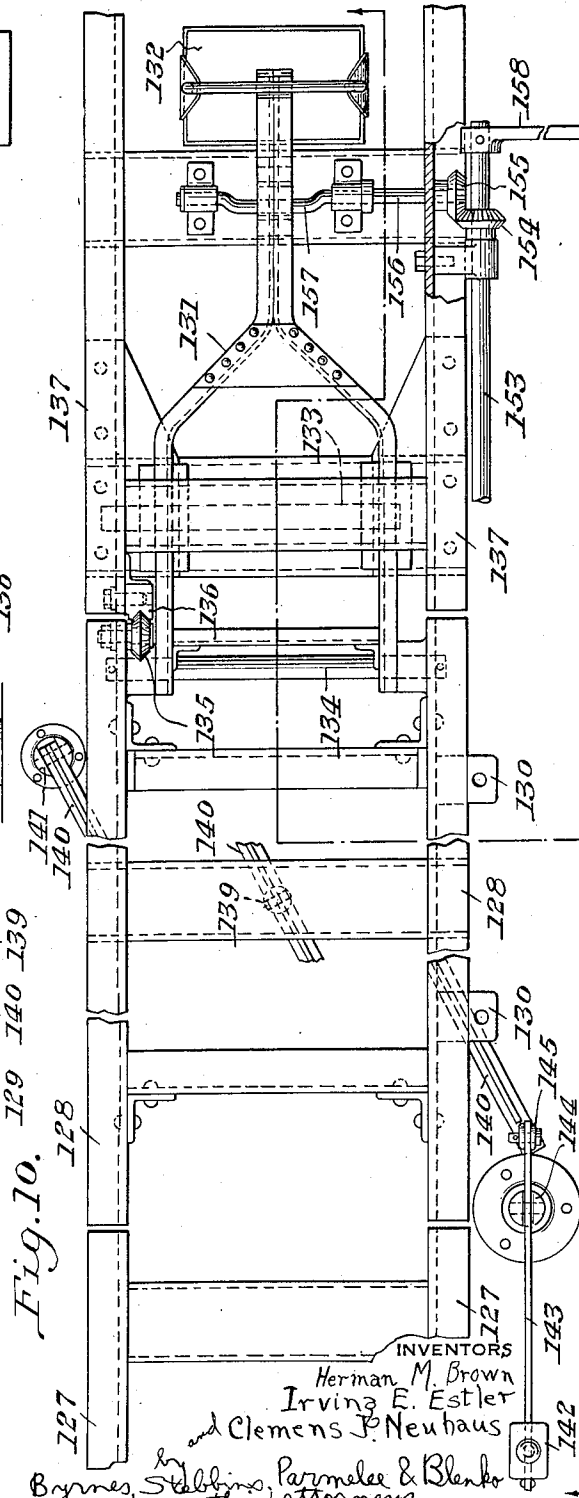
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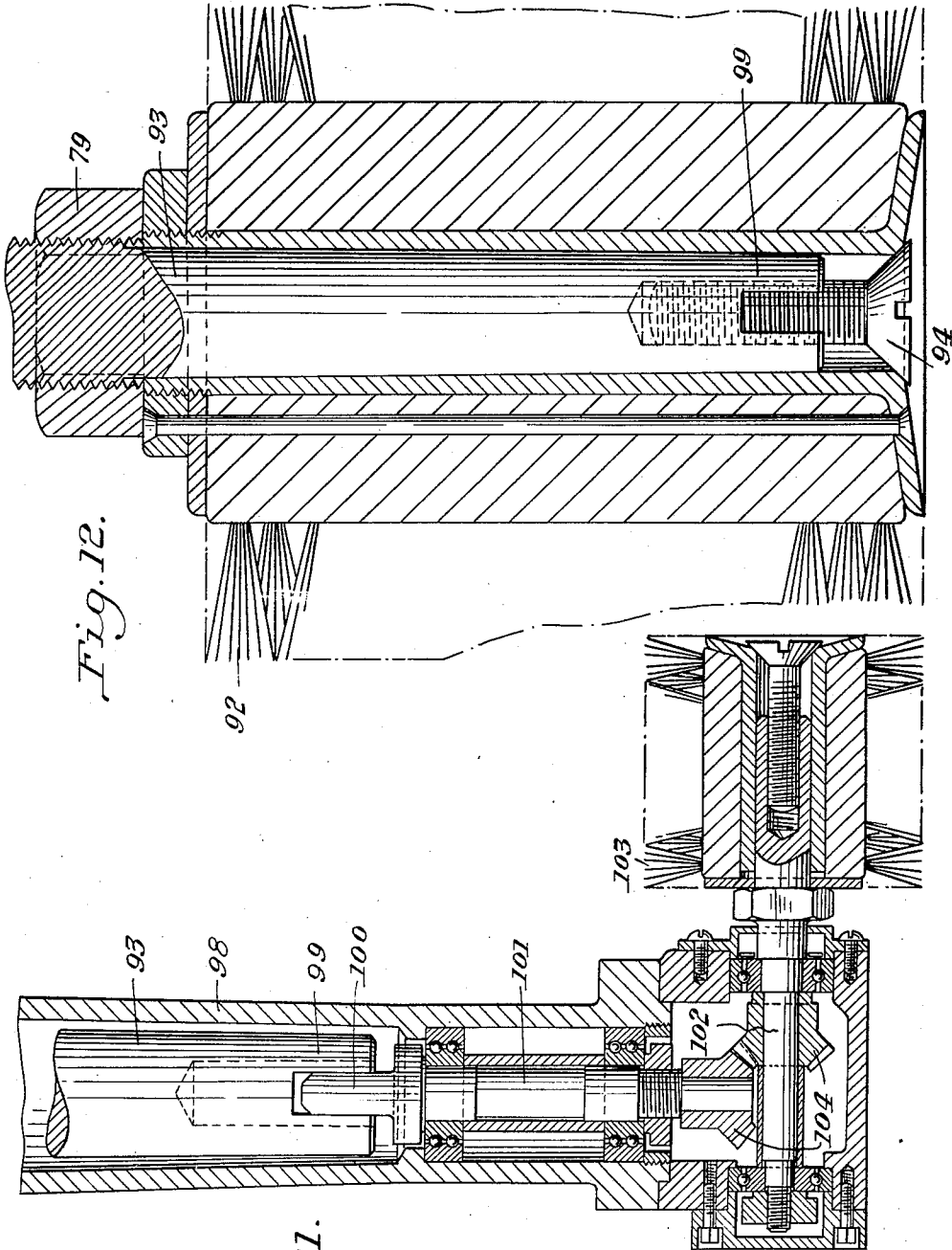


Fig. 11.

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Fig. 13.

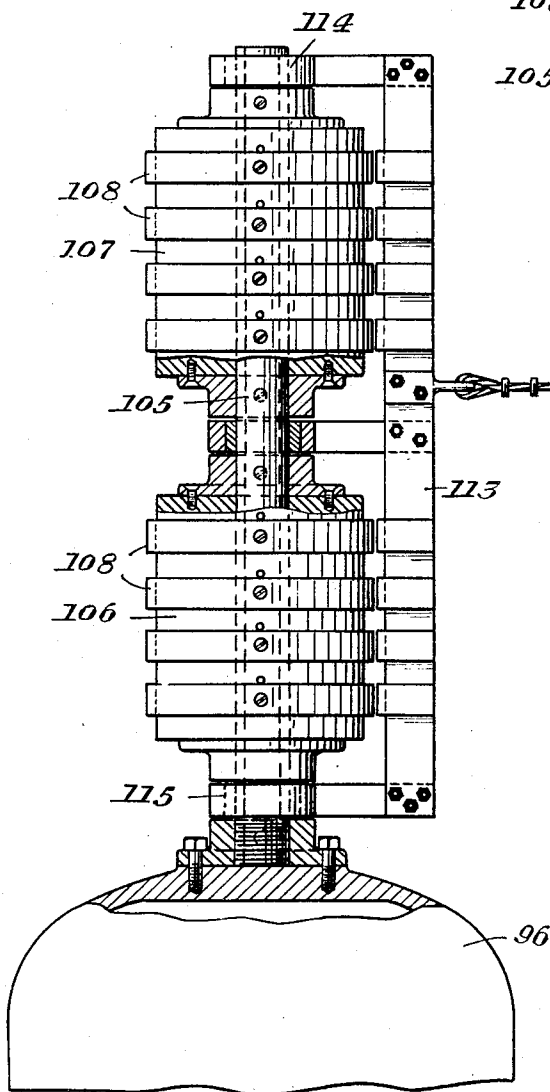
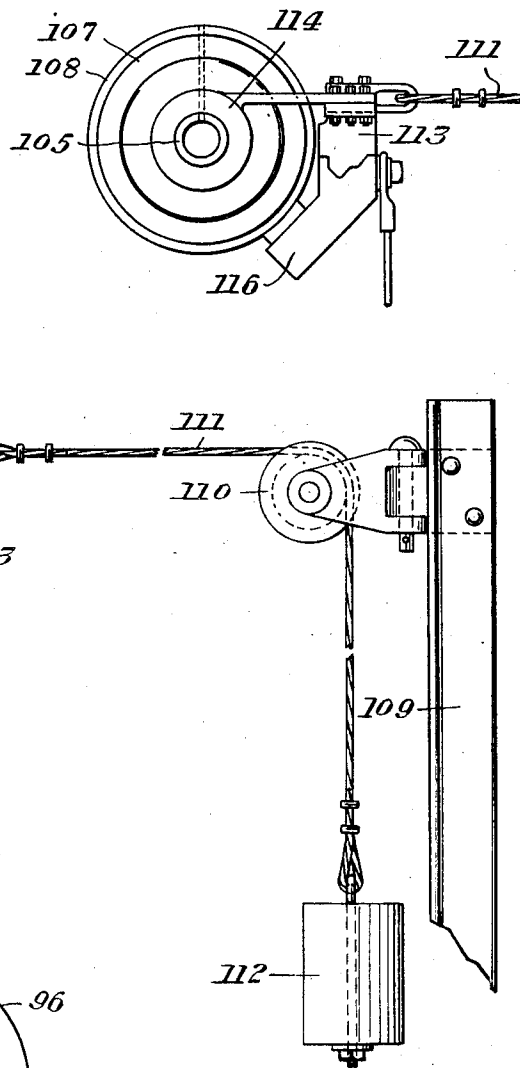


Fig. 14.



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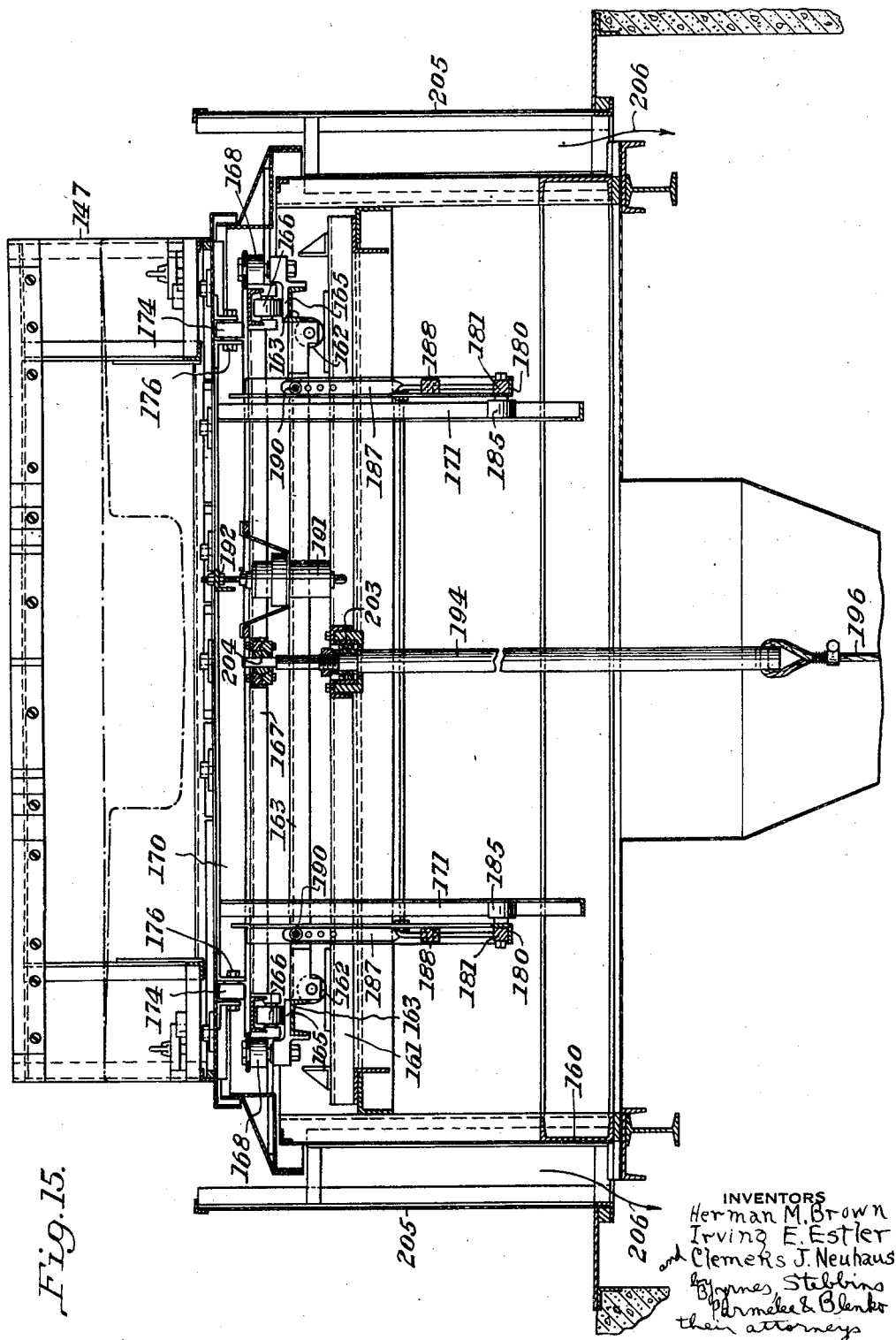
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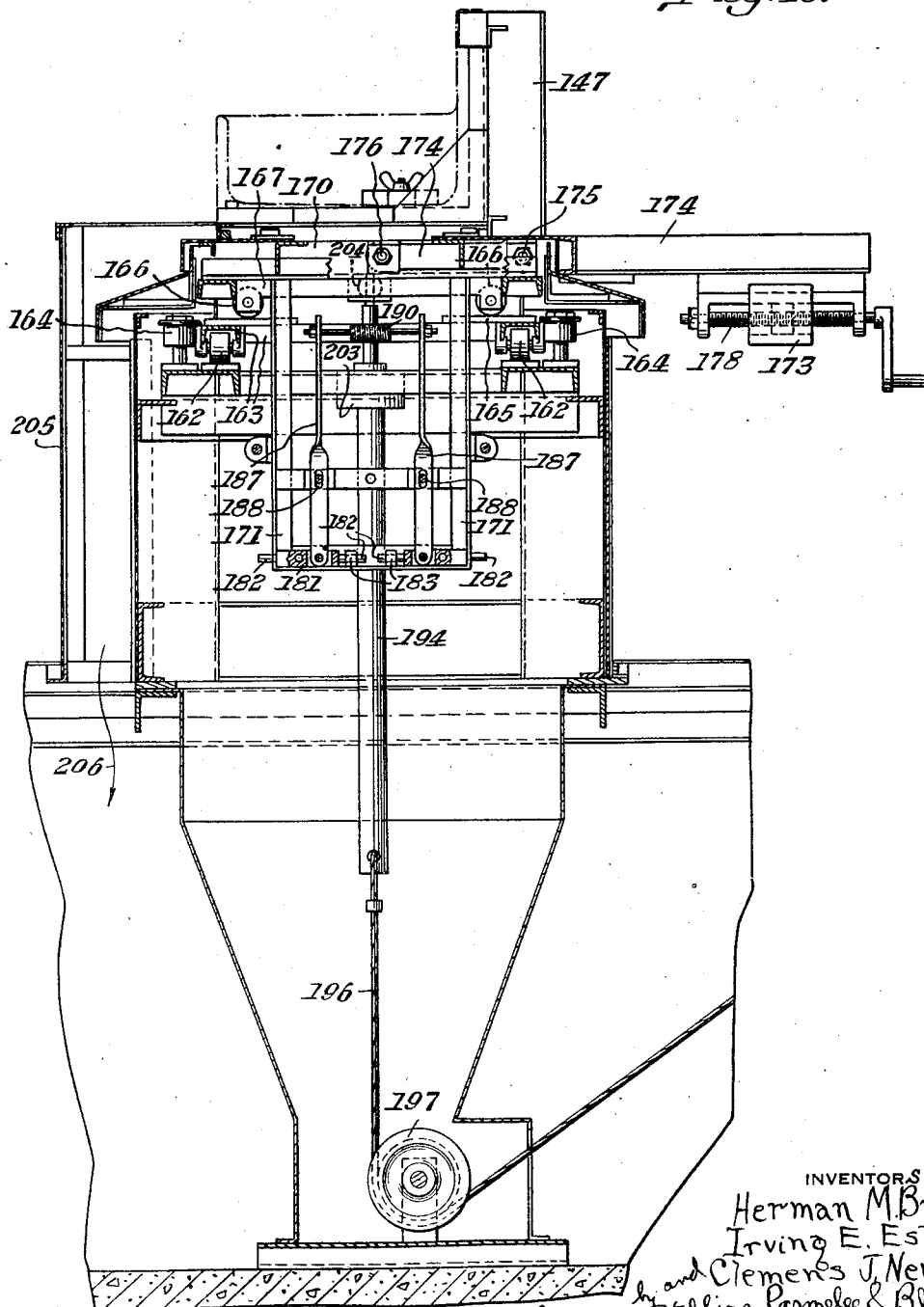
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Fig. 16.



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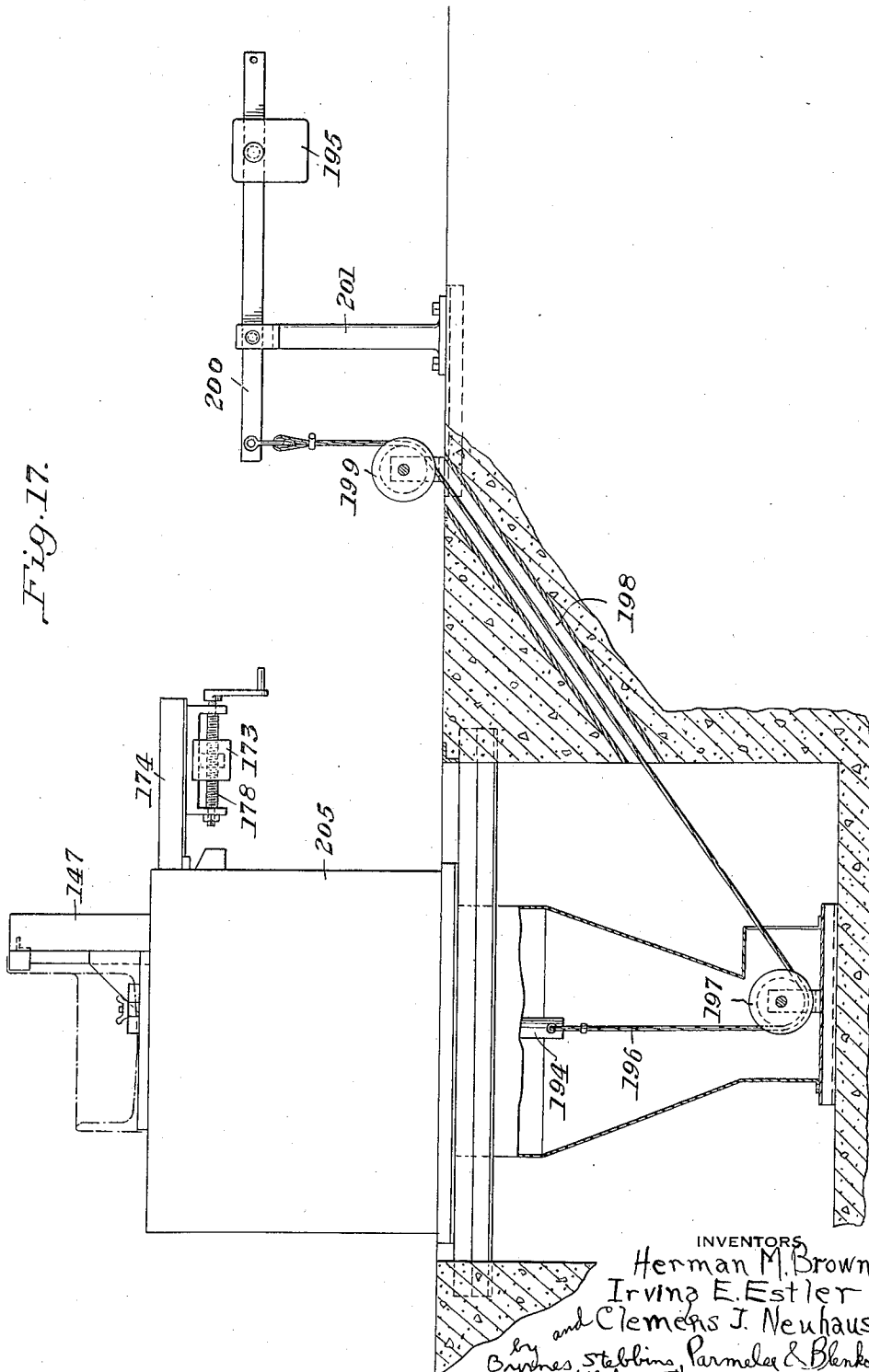
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Fig. 17.



UNITED STATES PATENT OFFICE

1,959,900

POLISHING MACHINE

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Application September 3, 1931, Serial No. 560,988

11 Claims. (Cl. 51—56)

This invention relates to a polishing machine, which may be used for buffing, scouring, grinding, or polishing articles having surfaces which are hard to get at with the ordinary type of polishing machine. One of the difficulties involved in satisfactorily polishing an article so as to obtain a smooth and uniform finish is the persistence, even though faintly, of the stripes which are left when a polishing tool is moved for a certain distance along a surface and then brought back to make another stroke. This is particularly true with hand polishing which has been frequently resorted to in connection with articles which do not readily lend themselves to machine production, due to the presence of corners and recesses such as bowls, sinks or the like. Hand polishing is relatively expensive. Moreover, the operators are in the habit of moving the polishing tool but a short distance and then lapping the next stroke of the tool so as to insure that all of the surface of the article is gone over. Even with painstaking care, the place where the tool starts to polish and where it ends will show up in the finished article. This is particularly true of the place where the polishing tool first comes into engagement with the article.

This difficulty has been taken care of by our improved polishing machine, which carries the polishing tool with a continuous movement along the surface or surfaces to be polished; and accordingly, there are not present on the surface of the finished articles the marks indicating the beginning and finish of discontinuous strokes.

More particularly, our invention relates to a polishing machine for use in polishing articles having a bowl, such as the bowl of a sink. The drain board of the article is provided with ridges, and it has been found that if too great a pressure is used in applying the polishing tool to the drain board, the ridges will be burned due to excessive friction with the same. In like manner it has been discovered that uniform pressure should be applied by the polishing tool when the same is moving about a corner of the article to polish the corner. One of the features of our invention is the arrangement of the parts of the machine whereby the polishing tool is carried by a bodily movable platform or similar support, so that carefully directed movements of the polishing tool in conformity with the configuration of the article being polished may be brought about. A further feature of our invention is the arrangement for yieldably supporting the article being polished, so that a light pressure of the polishing tool against the article being polished is in-

sured. The accurately directed movements of the support for the polishing tool, together with the exact control of the actuating means which bring about the various movements whereby the polishing tool is given arcuate movement about the corners and translatory along the flat surfaces of the article being polished, bring about a uniformity of polish which results in the articles being turned out with a highly pleasing finish. We will now describe in detail an illustrative embodiment of our invention, it being understood that while we show the form which is at present preferred, the drawings are merely illustrative and are not to be taken as limiting our invention. In the drawings,

Fig. 1 is a view in end elevation of the illustrative embodiment of our invention, parts being broken away to illustrate as much as possible of the machine in one figure;

Fig. 2 is a view in elevation on an enlarged scale of the upper part of Fig. 1, parts being broken away due to the enlargement;

Fig. 3 is a central vertical section along the axis of the spindle carrying the polishing tool and is taken at right angles to Fig. 2;

Fig. 4 is a plan view of the platform and turn table of the machine;

Fig. 5 is a sectional view through the yieldable support for the article being polished;

Fig. 6 is a fragmentary view showing an accessory tool for polishing the bottom surface of a recess;

Fig. 7 is a view in elevation of mechanism for adjusting the vertical spindle which carries the polishing tool;

Fig. 8 is a view in elevation taken at right angles to Fig. 7;

Fig. 9 is a side view of the support for the article to be polished, parts being broken away to bring as much as possible of the support within the confines of the figure;

Fig. 10 is a plan view of the support shown in Fig. 9;

Fig. 11 is a sectional view of an accessory tool for polishing the bottom of a recess;

Fig. 12 is a central sectional view showing the manner of assembling a polishing tool with its spindle;

Fig. 13 is a diagrammatic view showing the manner of mounting the distributor rings for the current supplied to the motors on the turn table;

Fig. 14 is a detail view illustrating the manner of mounting the distributor rings;

Fig. 15 is a view principally in central vertical

section of a modified form of support for the article to be polished;

Fig. 16 is a view principally in end elevation of the support shown in Fig. 15; and

Fig. 17 is a diagrammatic view showing the weight connected to the wobble mechanism.

Generally speaking, the polishing machine comprises a support similar to the usual track suspension for a traveling crane. Along the track is movable a bridge which carries a platform carrying the polishing tool and mechanism for actuating the same. This platform is movable along the bridge and, therefore, transversely of the track suspension. By rotating the polishing tool and imparting translatory movement to the platform, plane surfaces on the article may be polished by a continuous stroke of the polishing tool.

As a further refinement of our improved mechanism, we provide on the platform a turn table for carrying the polishing tool. It will be evident that if the polishing tool is mounted eccentrically with respect to the axis of the turn table, arcuate movement may be imparted to the spindle carrying the polishing tool. Since all articles do not have the same configuration and since, therefore, arcs having different radii will need to be taken care of, we provide for adjusting the eccentricity of the spindle carrying the polishing tool relative to the axis of the turn table. In order to bring the polishing tool to different heights, we provide mechanism for moving the spindle carrying the polishing tool vertically relative to the platform.

In Fig. 1 there is shown at the two sides of the figure, the standards 11 and 12 which carry the track suspension along which the bridge 13 travels. The track-way for the bridge comprises a pair of I-beams 14 and 15, and on the I-beam 14 is supported a ridged track 16, while on the I-beam 15 is supported a smooth track 17.

A grooved roller 19 is rotatably mounted by journal boxes 20 on the bridge 13 for cooperating with the track 16, and a smooth roller 21 is mounted by journal boxes 22 carried by the bridge 13 for cooperating with the smooth track 17. Beneath the tracks 16 and 17 are secured racks 24 and 25 with which gears 26 and 27 cooperate. The gears 26 and 27 are carried on the two ends of a shaft 28 driven through reduction gearing 29 and a speed reducer 30 from a motor 31. This motor is reversible and, therefore, the bridge 13 may be reciprocated back and forth along the tracks 16 and 17.

The bridge 13 is an open-work structure comprising parallel tracks 33 and 34 (shown more particularly in Fig. 3). A platform 35 is slidable along the tracks 33 and 34 transversely relative to the tracks 16 and 17. A V-shaped skid 36 cooperates with the grooved track 33, and a smooth skid 37 cooperates with the smooth track 34. The motor 39 carried by the bridge 13 drives a shaft 40 through reduction gearing 41 to move the platform 35 along the tracks 33 and 34. The shaft 40 is threaded for a considerable portion of its length, these threads cooperating with a nut 43 secured to the platform 35. Since the motor 39 is reversible, the screw threads on the shaft 40 move the nut 43 longitudinally of the shaft 40; and accordingly, the platform 35 is reciprocated along the tracks 33 and 34. A turn table 44 is rotatably mounted on an annular flange 45 surrounding a circular opening in the platform 35. A ring 46 secured to the underneath side of the turntable 44 engages beneath the flange 45 to

hold the turn table in position. A motor 48 is supported on the platform 35 and drives through reduction gearing 49 a shaft 50. A worm 51 is driven by the shaft 50; and in the embodiment illustrated is formed as an integral part of the shaft 50. This worm 51 meshes with a worm gear 52 secured to the periphery of the turn table 44. The motor 48 is reversible, and accordingly the turn table may be rotated relative to the platform 35.

The rotatable polishing tool is carried by the turn table; and when its axis does not coincide with the axis of the turn table, the polishing tool is swung bodily through an arc by turning the turn table. We prefer to adjust the eccentricity of the polishing tool and, therefore, provide a slide 54 having skids 55 and 56 cooperating with tracks 57 and 58 provided by the turn table 44 (these parts being shown in greater detail in Fig. 4). A screw 60 is secured to the slide 54; and a nut 61 rotatably mounted in a bearing 62 provided by a support 63 on the turn table 44 cooperates with the screw 60 to reciprocate the slide 54. A beveled gear 64 rotates the nut 61; and in the embodiments shown is formed integral therewith. A beveled gear 65 meshes with the beveled gear 64, being mounted on the lower end of a shaft 66. To the upper end of the shaft 66 is secured a sprocket 67 driven through a sprocket chain 68. A vertical shaft 69 having at its lower end a wheel 70 and at its upper end a sprocket 71 engaging the chain 68 may be manually rotated to reciprocate the slide 54. The sprocket chain 68 may be kept tight by spring-pressed rollers 72. By rotating the gear 64, and accordingly the nut 61, the screw 60 is reciprocated and with it moves the slide 54. It will be apparent from Fig. 4 that such adjustments of the slide 54 vary the eccentricity of the spindle with relation to the axis of the turn table 44.

In order to move the polishing tool to different heights, we mount in a hub 74 in the slide 54, a quill 75. The quill may be moved up and down within the hub 74; but turning movement is prevented by a feather 76 cooperating with a slot in the quill. Through openings in opposite sides of the hub 74 extend pinions 77 meshing with racks 78 on the quill 75. In the embodiment shown, the racks 78 are formed by cutting teeth in the sides of the quill. The pinions 77 are mounted on the ends of short shafts 80 journaled in bearings 81 provided by the hub 74. The other end of each shaft 80 carries a worm wheel 82 driven by a worm on a drive shaft 85. In order to drive the worm wheels 82 in opposite directions, one of these worms 83 is right-hand and the other, 84, is left-hand. The worm shaft 85 carries a sprocket 86 driven from a motor 87 by a chain 88 passing about a sprocket 89 on the motor shaft. The motor 87 is supported on a bracket 91 on the hub 74. A hand wheel 90 is secured to the motor shaft to permit hand adjustment of the quill if desired. The pitch of the worms 83 and 84 is such as to be self-locking. The motor 87 is reversible and, therefore, by controlling this motor the elevation of the quill 75 may be controlled.

The polishing tool 92 is fastened by a screw 94 onto the lower end of a spindle 93 rotatably mounted in the quill 75. The spindle is threaded for a short distance above the portion surrounded by the polishing tool 92, and a nut 79 cooperates with these threads for forcing the polishing tool 92 off of the spindle 93.

A table 95 having a central opening is threaded into the upper end of the quill 75. On this table rests a motor 96 whose shaft 97 is connected by a flexible coupling 98 to the spindle 93. It is apparent, therefore, that the racks 78 and pinions 77 are effective for elevating and lowering both the spindle 93 which carries on its lower end the polishing tool 92 and the actuating means for driving the spindle. The spindle 93 and the shaft 97 of the motor 96 operate efficiently as practically a single unit without the usual loss of power due to the friction of driving connections such as gearing or the like.

In the polishing of certain articles which require that the bottom of a recess be finished, it may be found desirable to use an accessory tool which can be driven from the spindle 93 to accomplish this purpose. A housing 98 which is internally threaded may be connected to the quill 75 by screwing the housing onto the threaded lower end of the quill. The lower end of the spindle 93 is provided with a coupling portion 99 which engages a coupling portion 100 on a shaft 101 journaled in the housing 98. A horizontal shaft 102 projects laterally from the housing 98 and carries on its outer end a polishing tool 103. Beveled gearing 104 connects the shaft 102 so as to be driven by the vertical shaft 101. By means of the rack and pinion mechanism above described, the polishing tool 103 may be lowered into engagement with the bottom of the recess, such as a sink bowl which is to be polished. The platform 35 may then be moved to give the desired stroke to the polishing tool. The shaft 102 may be caused to project at any angle from the spindle 93 by rotating the turn table 44 (see Fig. 4).

The control panel containing the switches for starting and stopping and controlling the speed of the various motors may be located at any convenient place. We prefer to support this panel from one of the I-beams 14 and 15 for the sake of safety, and so that the panel will be out of the way. The motors 31, 39, 87 and 48 are preferably direct current motors so that the speed of the same may be accurately controlled within the range of the motor. Each of these motors may be provided with a magnetic brake, so as to assist in accurate control of the movements of the turn table, platform, etc. The motor 96 may be an alternating current motor, if it is not desired to vary the speed of the tool from high to low.

The turn table 44 need not be returned to original position after being swung through any desired arc. On the contrary, the turn table may be rotated as many times as desired. The current for the motors mounted on the turn table 44 is so supplied that the lead-in wires are not twisted due to the rotation of the turn table. On top of the motor 96 is secured a standard 105 carrying one or more drums having on the surface thereof collector rings. In Fig. 13 a pair of drums 106 and 107 are secured on the standard 105. Each of the collector rings 108 is connected by a lead wire to one of the motors on the turn table. On a suitable support 109 carried by one of the I-beams 14 or 15 is mounted a pulley 110 over which is passed a cable 111 having a weight 112 at its lower end. The upper end of the cable is secured to a pivotal frame 113. The frame 113 is provided with upper and lower bearings 114 and 115 rotatably mounted on the standard 105. Brushes 116 (not shown in Fig. 13) are mounted at suitably spaced points

on the frame 113 for engaging the collector rings 108. The wires which are connected to the brushes 116 lead to the control panel, these wires being conventional and, therefore, not shown in the drawings. It will be apparent that the motor 96, together with the standard 105 may continue to rotate in one direction or the other while the brushes 116 are continually in contact with the collector rings 108.

The push button controls for the various motors are carried by an operator's cage which is adjustable. This cage is supported by the bridge 13, and is preferably positioned high enough so that the operator may look down into the bowl of the sink, so as to watch the polishing operation.

The article to be polished is preferably maintained stationary, while the polishing tool is being moved along the surface of the same. For some kinds of polishing operations, an ordinary support may be employed. Where, however, the pressure with which the polishing tool bears against the article being polished must be light, we prefer to yieldably mount the article so that the polishing tool will press but lightly against the article being polished, even though the position of the tool be not effected with extreme nicety. In Figs. 5, 9 and 10 we have illustrated a support which combines the yielding effect of springs with the yielding effect of counterbalancing devices to support the article so that excessive pressure is avoided. A chair 125 is mounted on wheels 126 so that the chair carrying the article to be polished may be rolled into position along the tracks 127. The chair 125 passes from the tracks 127 onto the tracks 128 of a counter-balanced table 129, and may be secured in position by any suitable type of locking means 130. A lever 131 is provided at each end of the table 129, each lever 131 carrying a heavy counter-weight 132 for the greater portion of the weight of the table 129 and the weight carried thereby. Each lever 131 pivots about a fulcrum 133 and bears at its inner end against a cross-bar 134 extending transversely of the end of the table 129. In order to guide the table 129 for vertical movement, the side members of the table carry spaced rollers 135 cooperating with grooved guide plates 136 secured to the rails 137 along which the chair 125 may be moved after the polishing of the article has been completed.

While the greater portion of the weight to be counter-balanced is to be taken up by the two heavy weights 132, we prefer to provide additional counterbalancing means. A pivot 139 engages beneath the center of the table 129. The lever 140 fulcrumed at 141 bears upwardly against the pivot 139 with a force determined by the position of a weight 142. This weight is slidable along a lever 143 pivoted on a post 144, the inner end of the lever 143 being connected by a turn buckle 145 to the end of the lever 140. By adjusting the weight 142 along the lever 143, the weight of the table 129 and the weight carried thereby may be accurately counterbalanced.

A rest 147 for the article to be polished is carried by a frame 148 made of angle irons or the like. The horizontal flanges of the angle irons may be supported on balls or the antifric-tion devices 149 illustrated in Fig. 5. The rest 147 is, therefore, freely movable over the anti-friction devices 149 in all directions except for the restraint of the springs which are carried by the chair 125 and engage the frame 148. A plurality of springs 150 which are adjustable by

means of set screws 151 are positioned about the frame 148 and press inwardly against the same. These springs are disposed both along the side of the frame and at the end of the same. Accordingly, the rest 147 is yieldably supported so that pressure on the article in any direction will cause the same to yield and reduce the pressure.

The counterbalancing weights 132 are intended to be in operation only while the chair 125 is in position for polishing, as shown in Fig. 9. While this chair is being rolled from the rails 127 onto the table 129, and while the chair is being rolled away along the rails 137, the table 129 is intended to be lowered into engagement with solid supports (not shown). In order to accomplish this, a shaft 153 extends along the side of the table 129 and carries at each end a beveled gear 154 meshing with a beveled gear 155 on a crank shaft 156. The crank 157 of this shaft is arranged to engage the respective lever 131 so as to hold the inner end of the same out from lifting engagement with the cross-bar 134. An operating lever 158 may be secured to the shaft 153 for operating the same manually; or the same may be rotated by power if desired.

A modified form of support for the article to be polished is shown in Figs. 15, 16 and 17. On the base 160 are carried rails 161 which the four wheels 162 of a lower carriage 163 may engage. Carriage 163 is guided as it moves longitudinally by four flanged rollers 164 attached to the rails 161 and base 160 (see Fig. 16).

The lower carriage 163 carries rails 165 cooperating with the four wheels 166 of an upper carriage 167, this upper carriage being movable at right angles to the lower carriage 163. Carriage 167 is guided as it moved transversely by four flanged rollers 168 attached to the rails 165 on carriage 163. The lower carriage 163 is movable longitudinally, and carries an upper carriage 167 which is movable transversely thereof; and accordingly movement in any direction is made possible for an article placed upon a rest or mounting 170, which is supported on and moved with the upper carriage. By means of a wobble mechanism later to be described, the carriage 167 is urged back into central position whenever, due to the pressure of the polishing tool, the carriage 167 is moved out of the original central position. As the displacement increases, the force which tends to return the carriage to original position increases.

The mounting 170 is free to lift to raised position or to lower again in a manner to be explained; and is guided during up and down movement by four guides 171, one adjacent each of the four corners thereof. Either springs or a counterweight may be provided for taking up the weight of the mounting 170 and the article to be polished. As shown, a counterweight 173 is mounted on the outer end of a yoke 174 fulcrumed at 175 and having its two arms pivoted at 176 to the mounting 170. The fulcrum 175 is provided by the upper carriage 167 so that the mounting 170 and counterweight 173 move with the upper carriage 167. The counterweight 173 is adjustable along the yoke 174, an adjustment screw 178 being provided for adjusting the counterweight so as to properly balance the weight of the mounting 170 and article supported thereby.

It will be noted that if the polishing tool bears down upon the article too heavily, the counterweight 173 will be lifted, and the pressure with which the tool engages the article will diminish.

As the yoke 174 rocks about its fulcrum 175, the mounting 170 raises and lowers, carrying with it the four guides 171. In order to guide the mounting 170 for vertical movement with respect to the upper carriage 167, the latter carries a pair of end frames 180. As seen more particularly in Fig. 16, each frame 180 carries a pair of slidable brackets 181. Each bracket 181 is formed with reduced end portions 182. The outer end projects through an opening in the frame 180, while the inner end slides through and is guided by a lug 183 on the frame 180. A roller 185 is mounted on a stud carried by each bracket 181. The guides 171 are conveniently manufactured from angle iron braced by a transverse angle iron connecting the lower ends of each pair of guides at the respective ends of the mounting, as shown in Fig. 15; and accordingly, each roller 185 engages a flange of the corresponding angle iron 171 to prevent longitudinal movement of the mounting 170 relative to the upper traveler 166.

Limited tilting of the mounting 170 about the pivots 176 is preferably permitted by the sliding of the brackets 181 relative to the frames 180. The brackets 181 are resiliently urged toward their outer position, as shown in Fig. 16, by levers 187 pivoted at 188 to the frame 180. The lower ends of these levers 187 are received in slots in the brackets 181 and their upper ends are resiliently connected, this resilient connection taking the form of a tension spring 190. The connection between the spring 190 and the levers 188 is adjustable to vary the leverage of the spring 190, a plurality of orifices being provided in each lever 188, as shown in Fig. 15.

Should the mounting 170 tilt in a clockwise direction, as seen in Fig. 16, about the pivots 176, thus tilting the guides 171, the bracket 181 shown at the right of Fig. 16 slides to left, carrying with it the right-hand lever 188. It will be noted that only a limited sliding movement is permitted since the bracket 181 soon comes into engagement with the lug 183. The swinging of the right-hand lever 188 takes place against the tension of the spring 190, since at this time the left-hand bracket 181 abuts against the frame 180 and cannot move outwardly. Should the mounting 170 tilt in a counter-clockwise direction, the left-hand bracket 181 would be moved inwardly until stopped by its lug 183.

In order to cushion the up and down movements of the mounting 170, we have mounted an oil dash pot 191 on the upper traveler 167. This dash pot is connected at 192 to the mounting 170.

As previously described, the upper carriage 167 and so also the mounting 170 are movable horizontally in any direction; and, therefore, if the polishing tool bears laterally against any surface with a heavy pressure, the mounting 170 is displaced, and the pressure with which the polishing tool bears against the article diminishes accordingly.

In order to yieldably urge the mounting 170 back to original central position we have provided the wobble mechanism above referred to. As shown more particularly in Figs. 15, 16 and 17, this mechanism includes a wobbling bar 194 to whose lower end a weight 195 is connected by a cable 196. As shown in Fig. 17, the cable 196 extends vertically downward to pass beneath a pulley 197 and then laterally through an opening 198. The outer end of the cable 196 is directed about a second pulley 199 and then extends vertically so as to be connected to the

inner end of a lever 200 pivotally mounted on a pedestal 201. A weight 195 is adjustably carried by the other arm of the lever 200. It is apparent, therefore, that the weight 195 tends to maintain the wobbling bar 194 in vertical position. This wobbling bar is carried by a bearing 203 supported by the base 160 permitting wobbling of the bar 194 in any direction. The upper end of the wobbling bar 194 is connected to the upper carriage 167 by a spherical bearing 204, a sliding movement of the bar through the bearing being permitted to a limited extent. As polishing of the article carried by the mounting 170 is carried on, heavy pressure of the polishing tool against the article displaces the mounting 170. Any movement of the upper carriage 167 from the original central position lifts the weight 195. Accordingly, the mounting 170 is urged towards the original central position by a force which increases as the displacement of the mounting increases.

The entire support is enclosed by a guard 205. This guard is connected to an exhauster which carries away the air and dust in the direction of the arrows 206.

The article to be polished is shown in Fig. 1 mounted in position to be engaged by the polishing tool 92. The quill 75 is adjusted by means of the racks and pinions 78, 77 to the proper elevation so that the polishing tool 92 may be passed along a band of surface on the article to be polished. The bridge 13 is movable to bodily carry the quill along the article, and the platform 35 is movable in a direction at right angles to the movement of the bridge. It is apparent, therefore, that four sides of an article may be polished by these simple movements, also round bowls. If the platform be moved relative to the bridge at the same time that the bridge is in motion, the resulting movement is at an angle to both and thus provides for polishing a different surface of the article. Should there be a rounded corner on the article to be polished, the platform is brought to the proper position and the turn table is set in motion so as to carry the quill about the axis of the turn table. The distance from the center of the turn table to the axis of the tool 92 may be adjusted by adjusting the slide 54. It is apparent, therefore, that the slide 54 may be adjusted until an arc proper for the article to be polished is obtained.

After a band of surface on the article has been polished, the quill 75 may be lowered or raised to polish another band of surface. When an article has a recess, such as shown in Fig. 1, the accessory tool shown in Fig. 6 may be employed. The polishing tool 103 shown in this figure is adapted to move over the bottom of the recess for polishing the same.

Due to the resilient mounting for the article to be polished, the polishing tool 92 or 103 cannot bear too heavily against a projecting portion of the article. The article is so mounted as to yield should the pressure of the polishing tool become excessive; but when the pressure is relieved the article returns to the original position. This automatically takes care of imperfect alignment of the article with the direction of movement of the bridge or platform. This yieldable mounting of the article also permits uneven surfaces to be polished without excessive wear of the projecting portions of the surface.

Certain of the advantages of our improved polishing machine result from the ability to move the polishing tool 92 in directions at right angles

to each other, and the further ability to swing the axis of the tool 92 through an arc so as to polish a rounded corner. Our improved machine has the further advantage that the elevation of the polishing tool may be changed without interfering with the alignment of the bridge and platform which carry the operating mechanism for the polishing tool. This operating mechanism rotates the tool without the intervention of reduction gearing or belts and has the advantage of efficiency and freedom from friction and the vibration which is generally incident to the use of gearing.

Our improved polishing machine also presents the advantage that the article to be polished is yieldably mounted so that if too great pressure is applied longitudinally or transversely of the article, or if the polish tool bears downwardly too heavily, the article may yield so as to reduce the polishing pressure.

While we have illustrated and described a specific form of polishing machine, together with a modification of the yieldable support for the article to be polished, it will be understood that the invention is not restricted to the particular construction or arrangement shown but may be variously embodied within the contemplation of the invention and under the scope of the following claims.

We claim:

1. A polishing machine comprising a platform movable bodily along a support, a turn table rotatably mounted on the platform, a base plate adjustably mounted on the turn table, a rotatable polishing tool carried by the base plate, and means for rotating said tool.

2. A polishing machine comprising a platform movable bodily along a support, a turn table rotatably supported on the platform with its axis of rotation substantially vertical, a rotatable polishing tool carried by the turn table, means for rotating said tool, and a support for an article to be polished, said support being yieldable laterally and being provided with means biasing the support toward normal position.

3. A polishing machine comprising a platform movable bodily along a support, a turn table rotatably supported on the platform, a vertical spindle rotatably carried by the turn table, means for raising and lowering the spindle relative to the platform, a horizontal spindle driven from the vertical spindle, a polishing tool mounted on the horizontal spindle, and means for rotating the vertical spindle.

4. In a polishing machine, the combination of a movable support, a polishing tool rotatably mounted on the support, means for rotating the polishing tool, and a yieldable support for an article to be polished, said yieldable support comprising a carriage movable to and from a central position, a second carriage carried by the first carriage and movable to and from a central position thereon, and means for urging said carriages toward their central positions.

5. In a polishing machine, the combination of a movable support, a polishing tool rotatably mounted on the support, means for rotating the polishing tool, and a yieldable support for an article to be polished, said yieldable support comprising a carriage movable to and from a central position, a second carriage carried by the first carriage and movable to and from a central position thereon, and wobble mechanism for urging said carriages toward their central positions.

6. In a polishing machine, the combination of a movable support, a polishing tool rotatably mounted on the support, means for rotating the polishing tool, and a yieldable support for an article to be polished, said yieldable support comprising a movable carriage, a second carriage carried by the first carriage and movable transversely relative thereto, yieldable means for biasing said carriages toward normal position and a member pivotally carried on said second mentioned carriage, said pivoted member providing a mounting for the article.
7. A yieldable support for an article to be polished, including a base, a carriage movable over the base to and from a central position, a second carriage carried by the first carriage and movable thereon to and from a central position, and means carried by the base for urging said carriages toward their central position.
8. A yieldable support for an article to be polished, including a base, a carriage movable back and forth over the base, a second carriage carried by the first carriage and movable relatively thereto at right angles to the direction of movement of the first mentioned carriage, and means carried by the base for yieldably urging said carriages toward their central position.
9. A yieldable support for an article to be polished, including a base, mechanism providing a mounting for the article movable in a plurality of angularly related directions over the base to and from a central position thereon, and a bar for urging said mechanism toward central position, said bar being pivotally mounted on the base for swinging movement relative thereto in a plurality of planes.
10. A yieldable support for an article to be polished, including a base, mechanism movable over the base to and from a central position thereon, means for urging said mechanism toward central position, a member pivotally mounted on said mechanism, said pivoted member providing a mounting for the article and means for counter-balancing the weight of said pivoted member and the article.
11. A yieldable support for an article to be polished, including a base, mechanism movable over the base to and from a central position thereon, a wobbling bar for yieldably urging said mechanism toward central position, a member pivotally mounted on said mechanism, said pivoted member providing a mounting for the article, and means for counter-balancing the weight of said pivoted member and the article.
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