May 9, 1933. C. B. LARSON 1,908,029

GRINDING, POLISHING, OR BUFFING MACHINE

Filed May 7, 1930 4 Sheets-Sheet 1

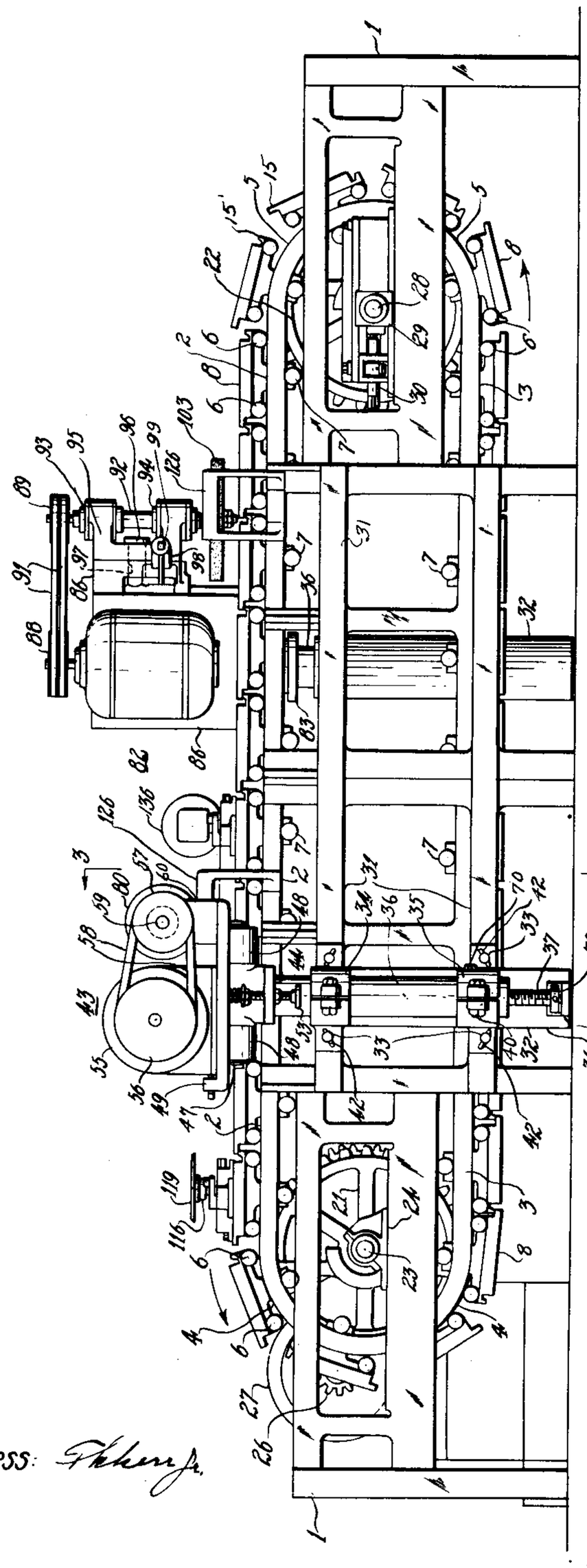

Fig. 1

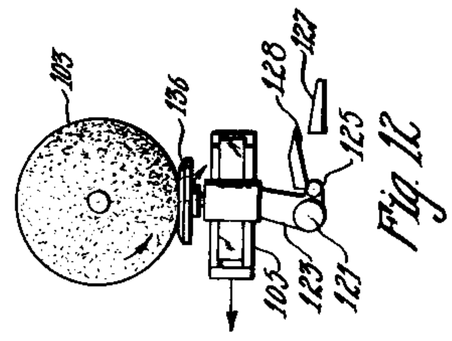

Fig. 12

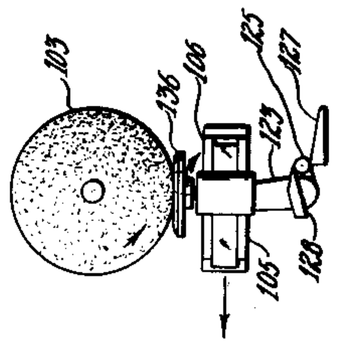

Fig. 11

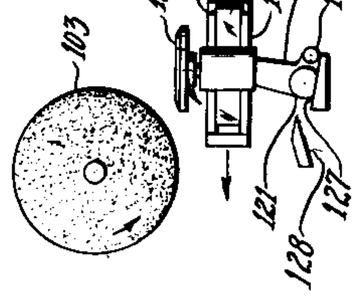

Fig. 10

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GRINDING, POLISHING, OR BUFFING MACHINE

Filed May 7, 1930 4 Sheets-Sheet 2

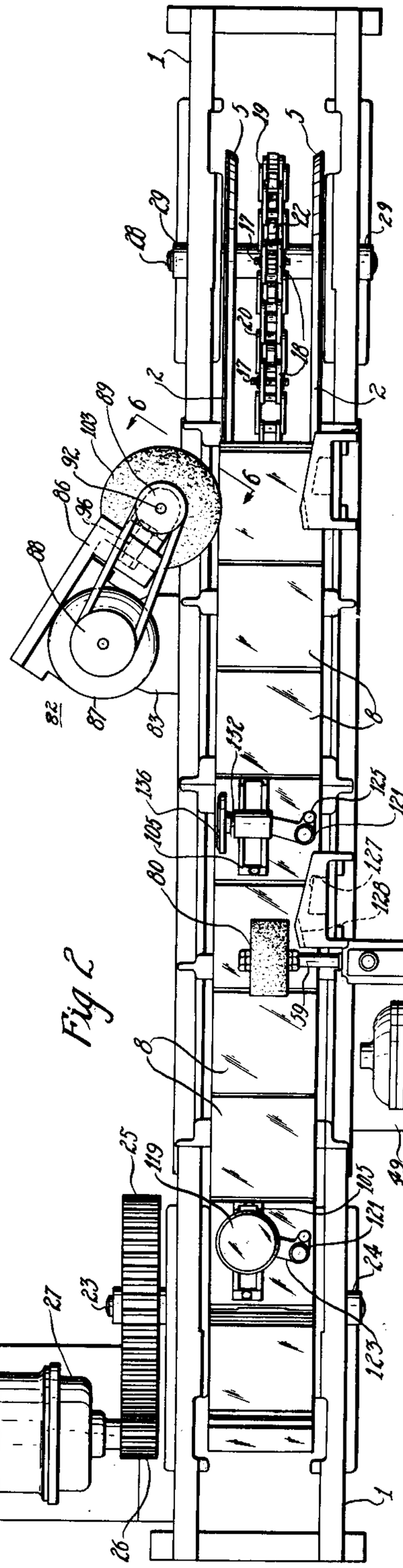

Fig. 2

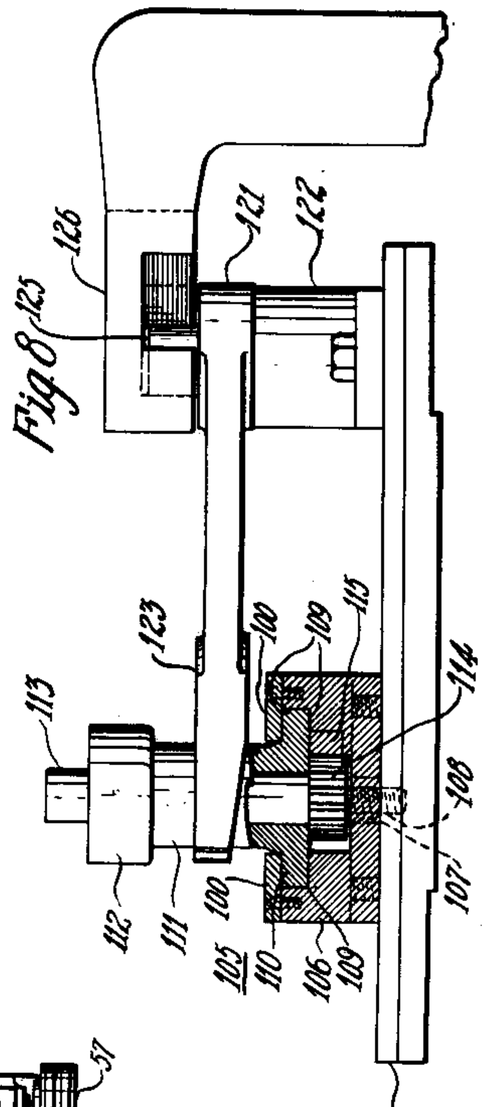

Fig. 8

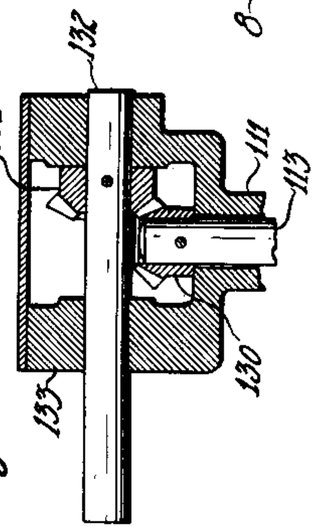

Fig. 9

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GRINDING, POLISHING, OR BUFFING MACHINE

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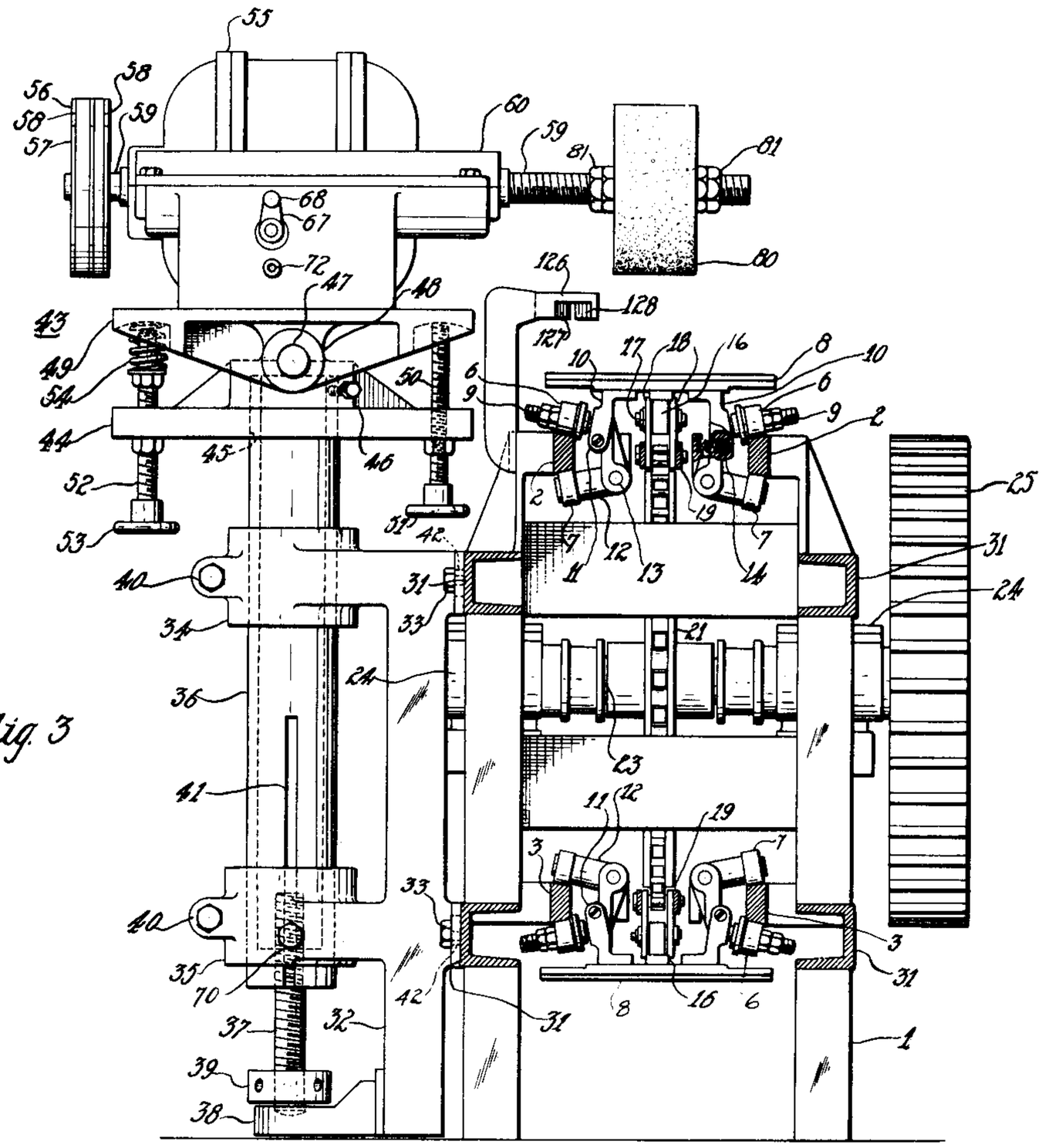
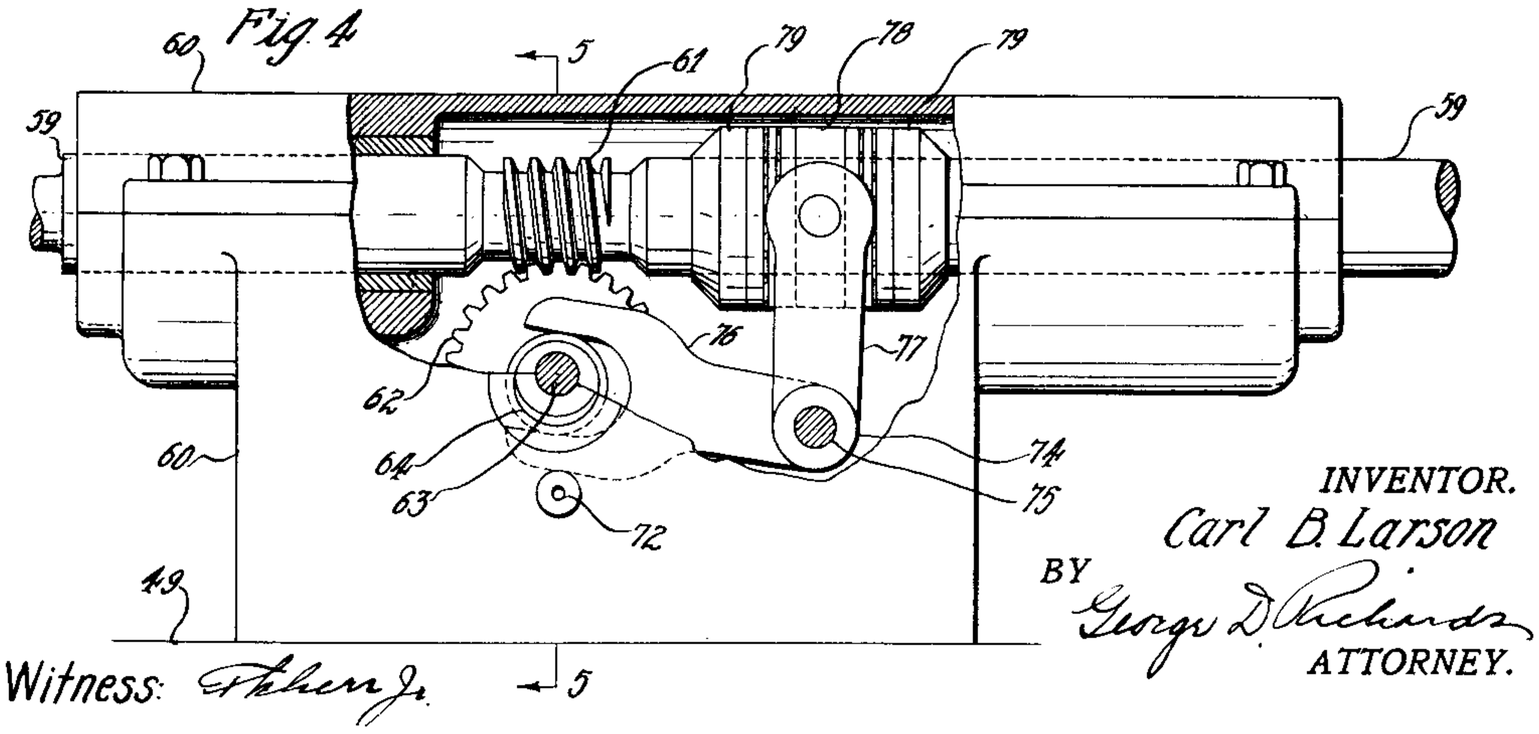


Fig. 3

Fig. 4



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May 9, 1933. C. B. LARSON 1,908,029

GRINDING, POLISHING, OR BUFFING MACHINE

Filed May 7, 1930 4 Sheets-Sheet 4

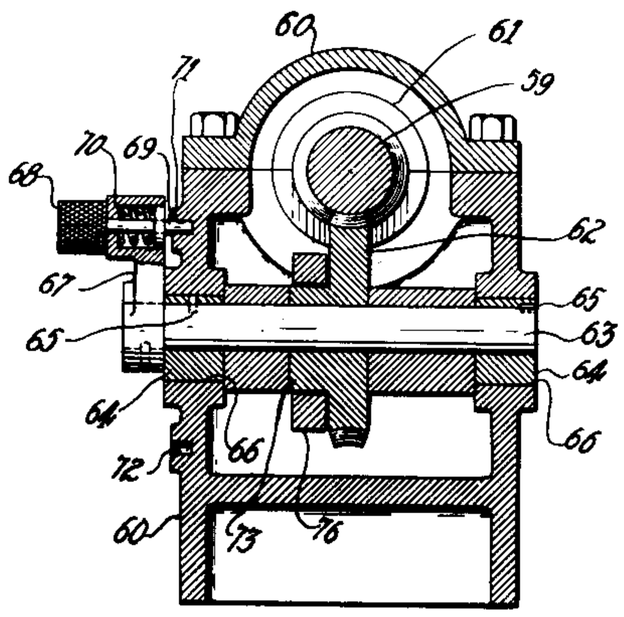


Fig. 5

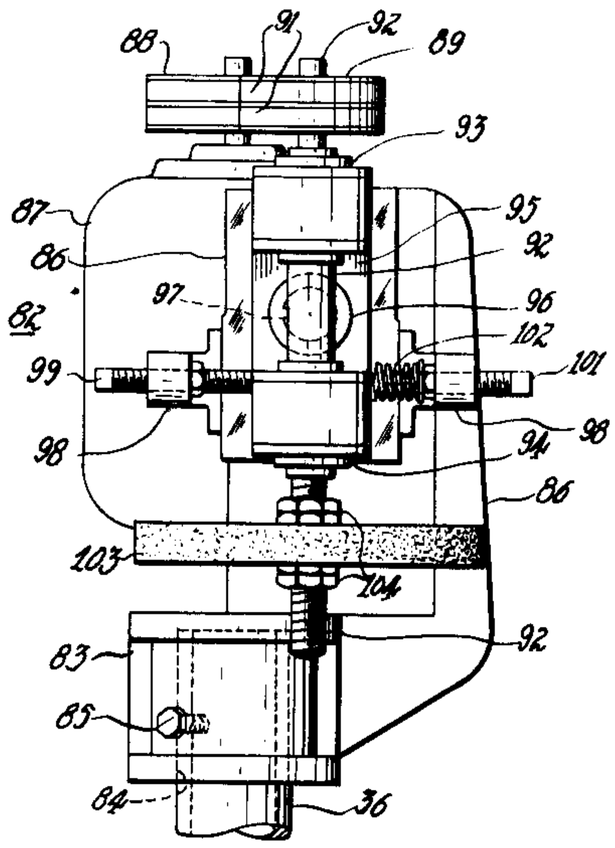
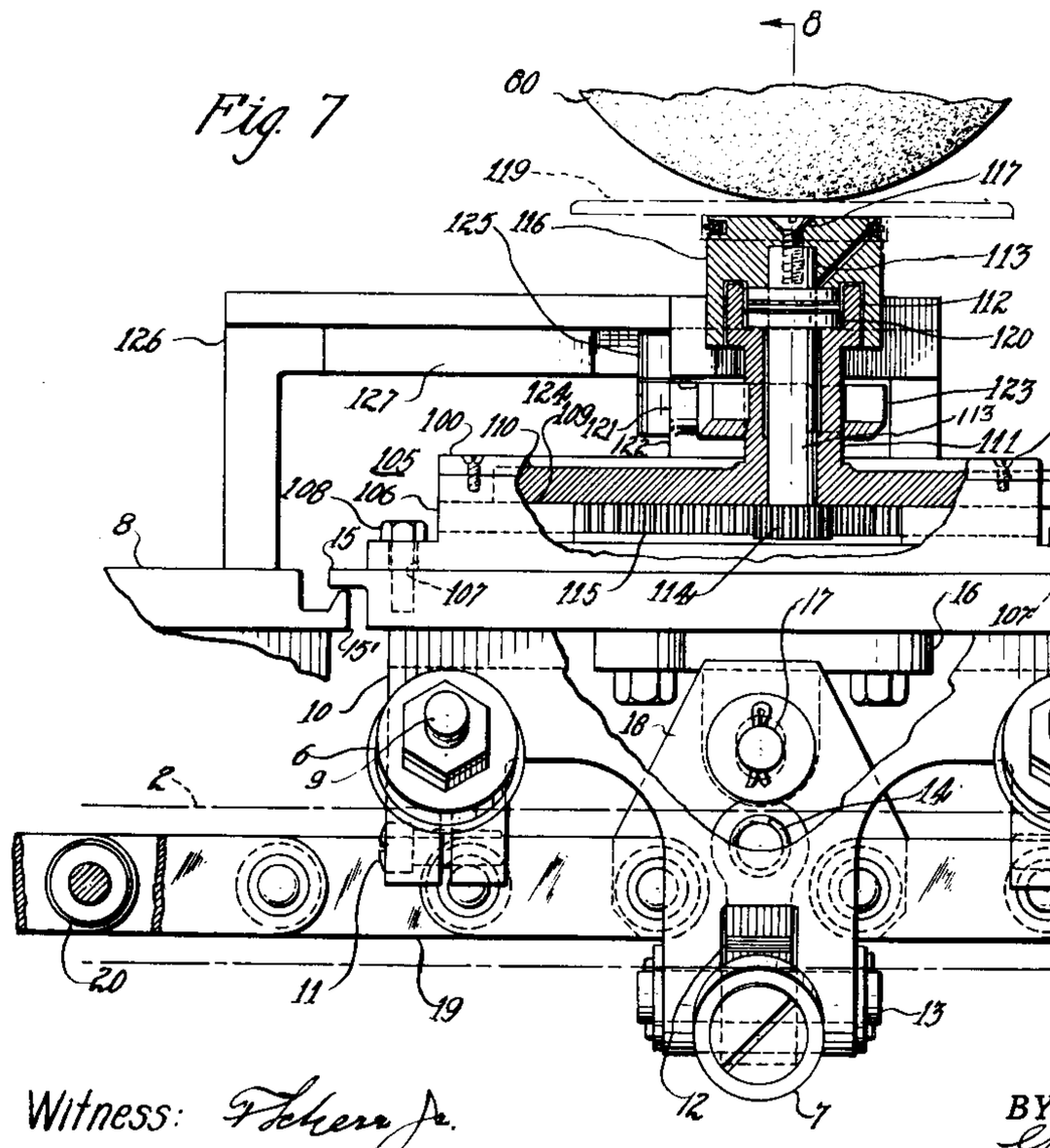


Fig. 6

Fig. 7



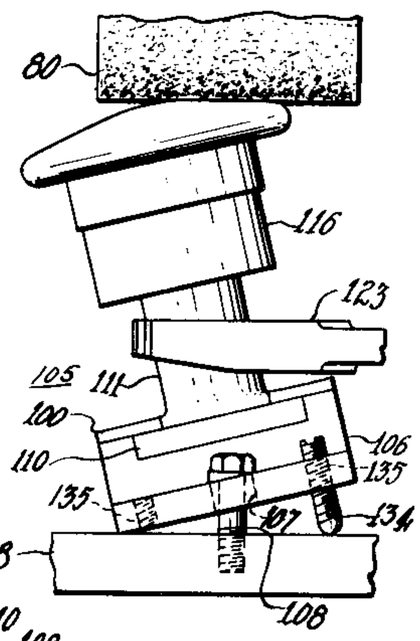


Fig. 13

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Patented May 9, 1933 1,908,029

UNITED STATES PATENT OFFICE

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GRINDING, POLISHING OR BUFFING MACHINE

Application filed May 7, 1930. Serial No. 450,365.

This invention relates generally, to the grinding, polishing or buffing of objects and the invention has reference, more particularly, to a novel machine for performing any one or all of said operations.

Grinding, polishing or buffing machines as heretofore generally constructed are subject to many limitations and objections in use. Such machines are frequently of limited capacities in that they turn out work slowly and ofttimes are merely capable of operating upon one class of goods or objects and often only upon a particular surface of said goods or objects. Frequently, such machines operate with an intermittent motion or feed, thereby even further slowing up production and causing increased power and maintenance costs. Labor costs are almost invariably high in operating such machines, owing to the necessity of employing considerable manual effort in attaching and removing the objects worked on as well as to carry out the operation or operations desired. Also, the work performed by such machines is frequently unsatisfactory owing to excessive vibration of the work holders or improper alignment of the machine parts.

The principal object of the present invention is to provide a grinding, polishing or buffing machine adapted to operate upon any desired kind of work or objects, said machine having a continuous feed or movement of the work supporting table or bed resulting in a maximum rate of production and cooperating means for temporarily retarding or stopping the forward movement of the work while the same is passing under an operating wheel, such as grinding, polishing or buffing wheel, whereby the operating wheel is given time to complete its operation upon the work before the same is again advanced.

Another object of the present invention lies in the provision of a grinding, polishing or buffing machine wherein the work is moved along without jolting or jarring and is held truly level as it moves smoothly along, thereby causing the operating wheels to produce neat and accurate work while requiring a minimum of driving effort.

A third object of the present invention is to provide a grinding, polishing or buffing machine having means for revolving the work operated upon as the same is temporarily held or retarded while under an operating wheel, whereby a maximum area of object is ground, polished or buffed without the production of scratches or disfiguring marks or serrations and in a minimum of time.

A fourth object of the present invention lies in the provision of a grinding, polishing or buffing machine having polishing heads adapted to universally support or hold grinding, polishing or buffing operating wheels, whereby the said wheels may be caused to conform to the surfaces of the objects treated irrespective of the shape of such objects, while at the same time enabling motion of the active surfaces of said operating wheels along lines which are other than parallel to the lines of motion of the surfaces of the objects operated upon.

A fifth object of the present invention lies in the provision of a grinding, polishing or buffing machine having polishing heads provided with means for reciprocating or vibrating the spindle carrying the operating wheel in the direction of the length of said spindle, whereby the operating wheel is given a motion parallel to its axis as the work passes under the same.

A sixth object of the present invention is to provide in a grinding, polishing or buffing machine having a frame supporting endless tracks adapted to receive platens forming a bed for rectilinear movement thereover, a transmission means having an independent driving connection with each of said platens, whereby each of said platens has a free motion with respect to the other platens and consequently passes smoothly around curves in said tracks and without vibration or jarring, such smooth motion being unaffected by wear or stretching of the transmission means.

Still another object of the present invention is to provide a grinding, polishing or buffing machine having polishing heads, work retarding and revolving means and

other additional fixtures which are adapted to be interchangeably applied to various forms of grinding, polishing or buffing machines other than the machine disclosed.

Other objects of this invention, not at this time more particularly enumerated, will be clearly understood from the following detailed description of the same.

The invention is clearly illustrated in the accompanying drawings, in which:—

Fig. 1 is a view in elevation of the novel grinding, polishing or buffing machine of this invention;

Fig. 2 is a plan view with parts omitted of the structure shown in Fig. 1;

Fig. 3 is an enlarged sectional view taken substantially along line 3—3 of Fig. 1, looking in the direction of the arrows;

Fig. 4 is an enlarged view with parts broken away of a portion of the structure shown in Fig. 3;

Fig. 5 is a sectional view taken along line 5—5 of Fig. 4, looking in the direction of the arrows;

Fig. 6 is an enlarged view in elevation of the vertical operating wheel carrying head looking in the direction of the arrows 6—6 of Fig. 2;

Fig. 7 is an enlarged fragmentary view of a portion of the structure shown in Fig. 1 and illustrates the work passing under an operating wheel;

Fig. 8 is a fragmentary part sectional view taken along line 8 of Fig. 7, looking in the direction of the arrow;

Fig. 9 is a fragmentary view showing a slight modification of the work retarding and revolving fixture.

Figs. 10, 11 and 12 are schematic views showing steps in the operation of the machine; and

Fig. 13 is a view in end elevation of a work retarding and revolving fixture and illustrates the adaptation of the fixture to accommodate various classes of work.

Similar characters of reference are employed in all the above described views, to indicate corresponding parts.

Referring now to said drawings, the reference numeral 1 designates the frame of the novel grinding, polishing or buffing machine of this invention as a whole. Frame 1 carries cooperating spaced oppositely arranged endless tracks. These tracks have upper runs 2 extending horizontally along the length of the frame 1 and positioned above the same, and lower runs 3 extending horizontally near the bottom of the frame, the said runs being connected at their ends by semi-circular track portions 4 and 5. The outer and inner wheel engaging surfaces of the tracks converge toward the center of the machine, as especially shown in Fig. 3, and are respectively engaged by flanged wheels 6 and by rollers or wheels 7 supporting platens 8.

Wheels 6 are rotatably mounted upon eccentric portions of studs 9 which are carried by brackets 10 secured to the inner side of platens 8. Studs 9 extend into cylindrical apertures in split bosses formed on brackets 10 and these studs are secured in such apertures by screws 11 (see especially Fig. 7) which bind the sides of the split bosses against the studs. By loosening screws 11, the studs 9 may be turned angularly within the apertures in the split bosses, thereby shifting the wheels 6 vertically with respect to the tracks, for example, track runs 2. By so shifting the wheels 6, the upper surfaces of the platens 8 may be made truly horizontal and aligned with one another.

Rollers 7, engaging the inner track surfaces, are rotatably carried by corresponding arms of bell cranks 12 which are pivotally mounted upon pins 13 carried by the brackets 10. Compression springs 14 acting between the other arms of bell cranks 12 and brackets 10 serve to urge the rollers 7 against the inner track surfaces at all times, thereby firmly retaining the platens 8 in position upon the tracks. Springs 14 by urging rollers 7 against the inner surfaces of the tracks also cause the wheels 6 to be urged against the outer track surfaces and since these surfaces of the tracks converge toward the center of the machine, springs 14 act to automatically center the platens 8 so that they are retained centrally of the machine at all times with their longitudinal axes midway between the tracks.

A bracket 16 is secured to the inner surface of each of the platens 8 at the center thereof and has a depending lug which is pivotally connected by a pin 17 to substantially triangular shaped link plates 18 (see especially Fig. 7) forming a link in an endless transmission or sprocket chain 19 having actuating rollers 20. Transmission chain 19 extends around a driving sprocket 21 and an idler sprocket 22 positioned at the respective end portions of the machine. Driving sprocket 21 is keyed upon a shaft 23 which is rotatably mounted in bearings 24 carried by frame 1. A gear 25 is keyed upon one end portion of shaft 23 and meshes with a driving pinion 26 that is keyed upon the armature shaft of a driving motor 27. Motor 27 drives shaft 23 through pinion 26 and gear 25, causing sprocket 21 in turn to drive transmission chain 19, thereby causing the platens 8 to move along the runs of the endless tracks and around the curved track portions 4, 5. Since the platens 8 are not connected directly together and are each individually driven by a central connection with the transmission chain 19, these platens have a free motion with respect to one an-

other and hence move along runs 2 and 3 and around curved portions 4 and 5 without interfering with or touching one another and without binding or vibration regardless of any stretch or wear of chain 19, any looseness in this chain simply causing a slightly greater spacing of the platens. Since the platens move smoothly at all times and without vibration, those platens on the upper track runs 2 remain truly horizontal causing the machine to turn out neat and accurate work. Idler sprocket 22 is rotatably mounted upon a shaft 28 mounted in bearings 29 carried by frame 1. A suitable tensioning device 30 is illustrated as associated with bearings 29 for removing any slack in transmission chain 19. Platens 8 are provided at their ends with overlapping cooperating projections 15 and 15', which though not touching one another are adapted to prevent foreign matter from falling onto track runs 2 or into the interior of the machine. In the event that foreign matter should fall upon the track, the yielding of springs 14 will enable wheels 6 or rollers 7 to ride readily over such foreign matter without injury to the machine.

The frame 1 is provided with side bars 31 at the sides thereof to which are adapted to be secured operating head pedestals 32, as by screws 33. Screws 33 extend through arcuate slots 42 provided in lugs formed on each of the operating head pedestals 32. Slots 42 have a common center of curvature and enable the operating head pedestal to be adjusted angularly for a few degrees about a horizontal axis extending substantially centrally through the pedestal midway between the side bars 31. Pedestals 32 are formed with vertically spaced brackets 34 and 35 which have aligned interior circular apertures for receiving hollow cylindrical posts 36 illutrated as open at their upper ends and closed at their lower ends. Posts 36 are adapted to support horizontal or vertical operating wheel heads and are vertically adjustable with respect to brackets 34 and 35. A threaded stud 37 is vertically aligned with the central vertical axis of each of the posts 36 and is turnably supported in a foot member 38 attached to pedestal 32. A collar 39 secured to stud 37 is adapted to be turned as by a spanner wrench to thereby turn stud 37 upon foot member 38. Stud 37 is threaded through a vertical central aperture provided in the bottom of the post 36. By turning collar 39 the stud 37 may be caused to raise or lower post 36 with respect to brackets 34 and 35. These brackets are split and are adapted, after the post has been adjusted to desired vertical position, to be clamped upon the post 36 as by bolts 40, thereby securely supporting the post in the desired vertical position. A vertical keyway 41 is provided in the post 36 and cooperates with a screw 70 threaded through a wall of bracket 35 to confine the motion of post 36 to a truly vertical movement.

The posts 36 are adapted to support vertical or horizontal operating wheel carrying heads. In Fig. 3 a post 36 is illustrated as supporting a horizontal operating wheel head designated as a whole by the reference numeral 43. Horizontal wheel carrying head 43 comprises a sub-base 44 turnably mounted upon the upper portion of post 36. Sub-base 44 has a central vertical recess 45 extending upwardly from its under surface for receiving the upper portion of post 36. Sub-base 44 may be turned with respect to post 36 about the central vertical axis of post 36 and this sub-base may be secured in any desired angular position, as by screws 46. A pivotal shaft 47 is turnably supported in a horizontal central bearing provided in sub-base 44 and extends outwardly from said bearing and through apertures provided in bosses 48 formed on a motor base 49. Pivotal shaft 47 is fixedly retained within the apertures in bosses 48 and enables the rocking of the motor base 49 about the top of sub-base 44. A vertical rod 50 having an operating handle 51 is threaded through an aperture in sub-base 44 at one side of shaft 47 and engages the underside of base 49 to serve as a stop for this base. A vertical rod 52 having operating handle 53 is threaded through sub-base 44 at the other side of shaft 47 and carries a compression spring 54 at the upper portion thereof. Compression spring 54 is confined between a washer carried by rod 52 and the base 49 and tends to urge the base 49 upwardly so as to turn about pivotal shaft 47 and engage the upper end of stop rod 50. Thus, as seen in Fig. 3, the spring 54 tends to cause the motor base 49 to revolve clockwise about pivotal shaft 47, which motion however is limited by stop rod 50 abutting the base 49. By suitably adjusting handles 51 and 53, the motor base 49 may be given any desired angular position about the pivotal shaft 47 within reasonable limits and may be urged toward the platens with any desired pressure.

A motor 55 is adjustably mounted upon base 49 and has a driving pulley 56 keyed upon its armature shaft. Pulley 56 drives a driven pulley 57 by means of a pair of transmission belts 58. Driven pulley 57 is keyed upon a reduced end portion of a horizontal operating wheel spindle 59. Operating wheel spindle 59 extends through and is rotatably mounted in bearings provided in a reciprocating gear casing 60. Within gear casing 60, spindle 59 is provided with a worm 61 which is adapted to mesh with a worm wheel 62 (see Figs. 4 and 5). Worm wheel 62 is rotatably mounted upon a shaft

63 extending transversely of and below spindle 59. Eccentric bushings 64 are mounted upon and secured to shaft 63 as by pins or keys 65. Eccentric bushings 64 are turnably mounted in bearings 66 provided in the walls of casing 60. One end portion of shaft 63 extends outwardly of casing 60 and has the hub of a crank 67 secured thereupon. The turning of crank 67 will revolve shaft 63 and the attached eccentric bushings 64, thereby causing worm wheel 62 to either mesh with or disengage worm 61 as desired. The handle 68 of crank 67 is provided with a detent 69 which is urged by a spring 70 toward casing 60. Detent 69 is adapted to engage in either of the two recesses 71 or 72 provided in the outer wall of casing 60. When detent 69 engages recess 71, shaft 63 is positioned so that worm wheel 62 engages worm 61 and when this detent engages recess 72, the worm wheel 62 is out of mesh with worm 61. Worm wheel 62 is provided with an accentric hub 73 at one side thereof.

A bell crank lever 74 is pivotally mounted upon a shaft 75 that extends parallel to shaft 63 and is supported at its end by the walls of casing 60. Bell crank lever 74 has a fork arm 76 which engages the eccentric hub 73. The other arm 77 of lever 74 is pivotally connected to a collar 78 loosely surrounding spindle 59. Collar 78 acts through anti-friction thrust bearings against collars 79 fixed upon spindle 59. Spindle 59 extends outwardly beyond the end of casing 60 and is adapted to have operating wheels, such as a grinding, polishing or buffing wheel 80, removably and adjustably mounted thereon by means of nuts 81. With motor 55 operating driven spindle 59, operating wheel 80 is rotated to thereby engage and act upon any work that passes below the same. When worm wheel 62 is out of mesh with worm 61, the spindle 59 has a pure rotative movement, but when worm wheel 62 engages worm 61, the worm wheel is caused to revolve, effecting an oscillatory movement of bell crank 74 and causing arm 77 thereof to reciprocate spindle 59 with an amplitude depending upon the eccentricity of hub 73 and the throw of the bell crank lever arms. In practice the amplitude of the reciprocating motion of spindle 59 is relatively small.

In Figs. 1, 2 and especially Fig. 6 a post 36 is illustrated supporting a vertical operating wheel head designated as a whole by the reference numeral 82. Vertical operating wheel head 82 comprises a sub-base 83 turnably mounted upon the upper portion of post 36. Sub-base 83 has a central vertical recess 84 extending upwardly from its under-surface for receiving the upper portion of post 36. Sub-base 83 may be turned with respect to post 36 about the central vertical axis of this post and this sub-base may be secured in any desired angular position, as by screws 85. Sub-base 83 has an offset upwardly extending angular supporting portion 86 upon which the base of a motor 87 is adjustably mounted. A driving pulley 88 is keyed upon the armature shaft of motor 87 and drives a driven pulley 89 by means of a pair of transmission belts 91. Driven pulley 89 is fixed upon a reduced upper extension of a vertically extending operating wheel spindle 92. The operating wheel spindle 92 extends downwardly through, and is supported by, spaced bearings 93 and 94 provided on a swivel bracket 95. The lower end portion of spindle 92 projects downwardly from bearing 94 and carries an operating wheel 103, such as a grinding, polishing or buffing wheel thereon. The operating wheel 103 may be adjusted up or down upon spindle 92 by nuts 104. Swivel bracket 95 is pivotally mounted on a bolt 96 that extends through an aperture 97 provided in the supporting portion 86. Oppositely arranged lugs 98 are secured, as by screws, to the supporting portion 86 adjacent the sides of the swivel bracket 95. A rod 99 is threaded through one of these lugs 98 and abuts one side of bracket 95 below bolt 96. A similar rod 101 is threaded through the other of these lugs 98 and carries a compression spring 102 which bears against the other side of swivel bracket 95.

By adjusting rods 99 and 101, the spindle 92 may be turned about the horizontal axis of bolt 96, thereby adjusting operating wheel 103 angularly in a vertical plane. It will be noted that by loosening the screw 85 and adjusting sub-base 83, the operating wheel 103 may be turned to any angular position about a vertical axis extending centrally through the posts 36. Also, operating wheel 103 may be raised or lowered as desired by raising or lowering post 36 through the use of stud 37. Also, arcuate slots 42 in the operating head pedestal provide for angular adjustment of operating wheel 103 about a horizontal axis. It will be noted, therefore, that wheel 103 is universally supported and may be adjusted to any operative position desired so as to enable the same to conform to the surface of the particular object worked upon. Also, it will be noted that horizontal operating wheel 80 carried by the horizontal wheel head is also universally supported so as to enable the same to conform to the surface of the object worked upon. If desired, the vertical operating wheel head 82 may be provided with a reciprocating gear casing in the same manner that the horizontal operating wheel head 40 is provided with the reciprocating gear casing 60. In this way spindle 92 may be given a reciprocating motion along its longitudinal

axis, thereby obtaining a wiping action upon the work as will further appear.

Platens 8 are adapted to carry work retarding and revolving fixtures designated as a whole by the reference numeral 105, as especially shown in Figs. 7 and 8. Fixture 105 comprises a housing 106 having end flanges which are provided with vertical apertures 107 through which screws 108 extend to secure the housing 106 upon platens 8. The housing 106 is provided with a horizontal slide bearing 109 extending longitudinally therethrough and upon which a slide plate 110 is adapted to reciprocate. Strips 100 retain slide plate 110 within slide bearing 109. Slide plate 110 is formed centrally of its length with an upwardly extending hollow post 111 having an enlarged portion 112 at the upper end thereof. A rotatable vertically extending shaft 113 is contained within post 111 and has its lower end portion projecting downwardly into the interior of housing 106. A pinion 114 is keyed upon the lower end portion of shaft 113 and meshes with a rack 115 which extends longitudinally within housing 106 and is secured to the side wall thereof.

A work holder 116 of any desired type is adapted to be attached to shaft 113, as by a screw or screws 117 extending through the work holder 116 and threaded into the upper portion of shaft 113. Work holder 116 is illustrated as having an object 119, such as a hub cap, attached thereto to be worked upon by the operating wheel 80. The downward thrust of operating wheel 80 upon the work 119 and work holder 116 is carried by an anti-friction thrust bearing 120 mounted upon an internal annular shoulder provided within the enlarged portion 112 of post 111. In some instances the construction of the upper portion of hollow post 111 is modified somewhat as shown in Fig. 9 so as to cause the work holder to be mounted upon a horizontal axis. As shown in this figure, the upper end of shaft 113 is provided with a bevel gear 130 which meshes with a similar gear 131 keyed upon a horizontal shaft 132 which is supported in bearings provided in an enlarged upper housing portion 133 provided on hollow post 111. Shaft 132 projects externally of housing portion 133 for receiving a suitable work holder.

In some instances, as when treating irregularly shaped objects, it may be desirable to mount the retarding and revolving fixtures 105 upon the platens 8 so that the posts 111 are inclined to the vertical, as illustrated in Fig. 13. As shown in this figure, the fixture 105 is tilted from the vertical by employing screws 134 which are threaded through apertures 135 provided in the end flanges of the fixture housings. Screws 134 abut the upper surfaces of the platens 8 and cooperate with screws 108 to retain the fixture in desired inclined position.

In Figs. 1 and 2 there are shown two retarding and revolving fixtures 105, one having a work holder mounted on the vertical shaft 113 and carrying object or work 119 for engagement by the operating wheel 80 mounted on the horizontal carrying head, and the other having a work holder carried by the horizontal shaft 132 upon which is mounted an object 136 for engagement by the operating wheel 103 mounted on the vertical carrying head. Although in these figures only two retarding and revolving fixtures 105 are shown, actually, in practice, many of these fixtures would be employed, each of the said fixtures being attached to a separate platen.

Bell crank levers 121 are turnably supported upon pedestals 122 which are secured as by screws to the platens 8 alongside of fixtures 105. Bell crank levers 121 have forked arms 123 which engage the hollow posts 111. The other arms 124 of bell crank levers 121 carry rollers 125 which are adapted to be actuated by cams 126 which are secured to the upper portion of frame 1 adjacent each of the operating wheels. Each of the cams 126 has two working faces 127 and 128 which are adapted to respectively and successively engage the rollers 125 and actuate bell crank levers 121 as the platens move along during the operation of the machine.

Assuming the grinding, polishing or buffing machine to be operating with the platens 8 moving along track runs 2 toward the left as viewed in Fig. 1, then the retarding and revolving fixtures 105 carried by the platens would also move toward the left or in the direction shown by the arrows in Figs. 10, 11 and 12. In these figures, the retarding and revolving fixture carrying the object 136 for engagement by the vertical operating wheel 103 is illustrated. If it be assumed that the object or work 136 is just approaching operating wheel 103 as shown in Fig. 10, and that roller 125 of bell crank 121 is just about to engage cam surface 127, then continued movement of the platen and fixture 105 will cause roller 125 to ride up on cam surface 127. As roller 125 rides up on this cam surface, forked arm 123 is moved forwardly, thereby correspondingly moving post 111 and slide plate 110 so that by the time roller 125 has reached the end of cam surface 127, the work or object 136 has moved forwardly into engagement with operating wheel 103. During the forward movement of slide plate 110 with respect to housing 106, the pinion 114, operating over rack 115, acts to revolve shafts 113 and 132 to cause work holder and work 136 to revolve in the direction shown by the arrow in Fig. 10.

Fig. 11 illustrates the roller 125 riding off of cam surface 127 and entering upon cam surface 128. As the platen continues to move forwardly, cam surface 128 acts upon roller 125 to move forked arm 123 rearwardly, thereby retarding the forward movement of slide plate 110 and object 136. Preferably, the inclination of cam surface 128 is such as to cause the rearward motion of forked arm 123 to just equal the forward motion of the platens, so that during the period that roller 125 is riding over cam surface 128, the work 136 is held in longitudinal alignment with operating wheel 103. During the rearward motion of arm 123, pinion 114 is operated by rack 115 to cause the work 136 to revolve in the direction of the arrow shown in Fig. 11. Thus, it will be noted that though the forward motion of the platens 8 is continuous, the work 136 is momentarily held opposite operating wheel 103 to enable this wheel to complete its work upon the object, while at the same time, the object is rotated about a central horizontal axis so as to cause all portions of the same to be uniformly treated and so as to prevent any possible scarring or marking of the object 136 by the operating wheel.

Although in Fig. 11 the cooperating parts are so proportioned as to cause the work to be retained opposite operating wheel 103, so long as the roller 125 engages operating cam surface 128, it is to be understood that the invention is not limited to cooperating parts of such proportions, but that the proportions may be varied so that work 136 may advance but slowly with respect to operating wheel 103 or it may even move rearwardly with respect to this wheel while roller 125 is engaging cam surface 128.

Fig. 12 shows roller 125 just leaving cam surface 128 with the work 136 still opposite the operating wheel 103. From this point on the work 136 will move at the same speed as the platens until another cam 126 engages the roller 125. The operation of retarding and revolving fixture 105 carrying work 119 while this work is passing under the horizontal operating wheel 80 is similar to that described in connection with the work 136.

Although the novel grinding, polishing or buffing machine of this invention has been disclosed for the sake of simplicity as having but a single vertical operating wheel carrying head and a single horizontal operating wheel carrying head, it is to be understood that as many of these heads, as desired, may be employed, and they may be arranged closely alongside one another. The horizontal operating wheels 80 acting successively upon work 119 and the vertical operating wheels 103 acting successively upon work 136. Also, it will be apparent that, if desired, either the horizontal or vertical wheel carrying heads together with their supporting posts may be readily detached from the machine of this invention and applied to machines having either a rectilinear motion or those having a rotary motion, such as machines of the type disclosed in my patent #1,158,136. Also, the retarding and revolving fixtures 105 together with their associated cams may be used for various types of machines including the machine disclosed in my above mentioned patent.

It will be noted that in operation, the platens 8, being disconectel from each other and being centrally connected to the driving transmission chain 19, move freely and smoothly along the tracks without wear or vibration and are maintained level while passing over the upper runs 2 by the action of rollers 7 and cooperating springs 14, thereby insuring a definite and fixed distance between the operating wheels and the platen surfaces, resulting in accurate and neat work. The adjustment of rods 52 and 101 determines the tension of the springs 54 and 102 and consequently the pressure with which the repective operating wheels 80 and 103 are urged against the work. The adjustment of rods 50 and 99 determines or limits the inward movement of the operating wheels toward the work. In some instances, as when using a grinding wheel, the springs 54 and 102 may be removed and the rods 52 and 101 screwed firmly against their respective operating wheel supports. If for any reason the surface of the work is not true, such irregularities are compensated for by the yielding of the operating wheels. Thus operating wheel 80 may yield upwardly by compressing spring 54 mounted on rod 52. Likewise operating wheel 103 may yield transversely by compressing spring 102 mounted on 101. In this way accurate and neat work is obtained whether or not the surfaces of the objects are true. The universal mounting of the operating wheels 80 and 103 enables these wheels to be positioned so as to conform to various surfaces of the work and if desired, permit the setting of these wheels on a bias with respect to the direction of motion of the work so as to secure more rapid action as is well known to those skilled in the art.

Also, the reciprocation of the operating wheel spindles by the use of the reciprocating gear casing 60 enables the wiping of the work by the operating wheels, thereby further speeding up the output and eliminating disfiguring marks or scratches.

The use of the retarding and revolving fixtures 105 enables continuous forward movement of the platens with a continuous feed of the machine, while at the same time the work is temporarily retarded or held opposite the operating wheels to give these wheels sufficient time to complete their operation upon the work, while at the same time the

work is revolved through the agency of this fixture so as to obtain uniform action over the entire surface thereof. The extent to which the work is revolved by the fixture 105 will depend entirely upon the proportions of pinion 114 and upon the length of cam surface 128. Preferably the work will make one revolution or over while retarded or held opposite the operating wheels. It will be apparent that in handling some kinds of work and especially work of large dimensions, it will be desired to merely retard the work without revolving the same in which event the work holder does not revolve but the shaft 113 or 132 revolves within a bushing provided in the work holder.

With the novel grinding, polishing or buffing machine in operation, the operator may stand at any convenient point along the length thereof to apply or detach work from the work holders. In some instances it will be desirable to employ more than one operator, in which case one may put the work on and the other may remove the same from the machine. In the event that the work is of large dimensions, it may be mounted upon two or more successive platens and attached at one end of the machine and removed at the other end thereof without passing around the circular portions 4 and 5 of the tracks.

As many changes could be made in the above construction and many apparently widely different embodiments of this invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:—

1. In a machine of the class described, in combination, a support, a horizontal platen mounted thereon so as to be free to move in a horizontal plane, means for adjusting said platen vertically with respect to said support at a plurality of spaced points around said platen whereby the same shall remain truly horizontal, driving means, and a flexible transmission member connected to said platen and passing over said driving means for effecting movement of said platen.

2. In a machine of the class described, in combination, a frame, a pair of spaced tracks carried by said frame, a platen having wheels engaging said tracks for movement therealong in a horizontal plane, resilient means carried by said platen and engaging certain of said wheels for yieldably holding said platen down on said tracks, said certain wheels being automatically yieldable to allow said platen to ride over obstructions on said tracks, a driven driving sprocket, a transmission chain having a link thereof connected to said platen, said transmission chain passing over said driving sprocket to effect movement of said platen and an operating member arranged to engage work carried by said platen.

3. In a machine of the class described, in combination, a frame, a pair of spaced tracks carried by said frame, said tracks having inner and outer surfaces converging toward the center of said machine, a platen having wheels mounted on inclined axes for engaging the inner and outer surfaces of said tracks for movement therealong in a horizontal plane, resilient means cooperating with certain of said wheels for retaining said platen truly horizontal and centrally positioned with respect to said tracks, a motor driven driving sprocket, a transmission chain having a link thereof connected to said platen, said transmission chain passing over said driving sprocket to effect movement of said platen and an operating member arranged to engage work carried by said platen.

4. In a machine of the class described, in combination, a frame, a pair of spaced endless tracks carried by said frame, said tracks having upper and lower horizontal runs and connecting curved runs, the runs of said tracks having beveled surfaces which converge toward the center of said machine, a bed comprising a plurality of independent platens extending around said tracks and mounted thereon for movement therealong, the beveled surfaces of said tracks acting to retain said platens in longitudinal alignment with one another, a driving sprocket positioned adjacent said tracks, a transmission chain, individual connections connecting each of said platens with said transmission chain, said transmission chain passing over said driving sprocket for effecting movement of said bed.

5. In a machine of the class described, in combination, a frame, a pair of spaced endless tracks carried by said frame, said tracks having upper and lower horizontal runs and connecting curved runs, the runs of said tracks having beveled surfaces which converge toward the center of said machine, a bed comprising a plurality of independent platens extending around said tracks and mounted thereon for movement therealong, said platens having inclined wheels engaging the beveled surfaces of said tracks and pressed thereagainst to retain said platens in longitudinal alignment with one another, a driving sprocket positioned adjacent said tracks, a transmission chain, individual pivotal connections connecting the central portion of each of said platens with said transmission chain, said transmission chain passing over said driving sprocket for effecting movement of said bed, and an operating member universally mounted adjacent said bed for engaging work carried thereby.

6. In a machine of the class described, in

combination, a pair of spaced continuous tracks, a plurality of independent platens movable along said tracks, means for individually moving said platens along said tracks, an operating member for engaging work placed on said platens, each of said platens having wheels engaging opposite surfaces of said tracks and resiliently pressed thereagainst for holding said platens in fixed relation to said operating member as they move along.

7. In a machine of the class described, in combination, a support, a bed mounted thereon so as to be free to move thereover, means for moving said bed forwardly over said support with a continuous motion, an operating member positioned adjacent said bed, and a work carrying fixture mounted on said bed and acting to temporarily retard the forward motion of the work carried thereby as such work arrives opposite said operating member.

8. In a machine of the class described, in combination, a support, a bed mounted thereon so as to be free to move thereover, means for moving said bed forwardly over said support with a continuous motion, an operating member positioned adjacent said bed, a work carrying fixture mounted on said bed, and means cooperating with said work carrying fixture for causing the latter to temporarily retard the forward motion of work carried thereby upon the engagement of said operating member by the work.

9. In a machine of the class described, in combination, a support, a bed mounted thereon so as to be free to move thereover, means for moving said bed forwardly over said support with a continuous motion, an operating member positioned adjacent said bed, a work carrying fixture mounted on said bed and acting to temporarily retard the forward motion of the work carried thereby while revolving the same as such work arrives opposite said operating member.

10. In a machine of the class described, in combination, a support, a bed mounted thereon so as to be free to move thereover, means for moving said bed forwardly over said support with a continuous motion, an operating member positioned adjacent said bed, a work carrying fixture mounted on said bed, a lever mounted on said bed and engaging said fixture, and a cam positioned adjacent said operating member and serving to actuate said lever when the work carried by said fixture engages said operating member, to thereby cause said fixture to temporarily hold the work in engagement with said operating member while at the same time revolving such work.

11. In a machine of the class described, in combination, a support, a bed mounted thereon so as to be free to move thereover, means for moving said bed forwardly over said support with a continuous motion, an operating wheel universally mounted adjacent said bed, a work carrying fixture mounted on said bed and operating to temporarily retard the forward motion of the work carried thereby as such work arrives opposite said operating wheel, said operating wheel being arranged to be pressed against work and stop means to limit the motion of said wheel toward the work.

12. In a machine of the class described, in combination, a frame, a pair of endless tracks carried by said frame, said tracks having upper and lower horizontal runs and connecting curved runs, a bed comprising a plurality of independent platens extending around said tracks and mounted thereon for continuous movement therealong, an operating wheel mounted adjacent said platens and arranged for adjustment about all axes, work carrying fixtures mounted on said platens, lever means mounted on said platens and engaging said fixtures, a cam arranged adjacent said operating wheel and acting to actuate said lever means to cause successive fixtures as they arrive opposite said operating wheel to temporarily hold and revolve work while in engagement with said operating wheel.

13. In a machine of the class described, in combination, a frame, a pair of endless tracks carried by said frame, said tracks having upper and lower horizontal runs and connecting curved runs, a bed comprising a plurality of independent platens extending around said tracks and mounted for continuous movement therealong, an operating wheel mounted adjacent said platens and arranged for adjustment about all axes, each of said platens having wheels engaging opposite surfaces of said tracks for holding said platens firmly on said tracks to thereby maintain said platens in fixed relation to said operating wheel as they move along, work carrying fixtures mounted on said platens, lever means mounted on said platens and engaging said fixtures, a cam arranged adjacent said operating wheel and acting to actuate said lever means to cause successive fixtures as they arrive opposite said operating wheel to temporarily hold and revolve work while in engagement with said operating wheel, and means for reciprocating said operating wheel along its longitudinal axis.

14. In a machine of the class described, in combination, a frame, a pair of spaced tracks carried by said frame, said tracks having upper and lower runs and end runs interconnecting said upper and lower runs, whereby said tracks are continuous, the outer surfaces of the runs of said tracks being oppositely inclined so as to lie in converging

planes, the converging surfaces of said tracks serving to automatically center said platens on said tracks, whereby side play of said platens is automatically prevented.

15. In a machine of the class described, in combination, a frame, a pair of spaced tracks carried by said frame, said tracks having upper and lower runs and end runs interconnecting said upper and lower runs, whereby said tracks are continuous, the outer surfaces of the runs of said tracks being oppositely inclined so as to lie in converging planes, platens movable over said tracks, a driving wheel, a flexible transmisison member connected to said platens and passing over said driving wheel for effecting movement of said platens along said tracks, said platens having wheels mounted on the inclined outer surfaces of said tracks so as to move therealong, said platens having additional wheels mounted on the inner surfaces of said tracks so as to move therealong, and resilient means carried by said platens for urging said additional wheels against the inner surfaces of said tracks, whereby the first named wheels of said platens are pressed against the converging outer surfaces of said tracks, thereby bedding the platens down upon the tracks and preventing side play of said platens.

16. In a machine of the class described, in combination, a frame having continuous trackage thereon, a bed mounted on said trackage for movement therealong, an operating head pedestal removably attached to said frame, a supporting post adjustably held by said operating head pedestal, an operating wheel head mounted on said supporting post, said operating wheel head comprising a base adjustably attached to said supporting post, an operating wheel adjustably carried by said base and a driving motor carried by said base for driving said operating wheel, the adjustment of said supporting member, said base and said operating wheel enabling the complete universal adjustment of said operating wheel with respect to work carried by said bed, a resilient spring member included in the adjustable mounting of said operating wheel for holding said wheel yieldingly in contact with the work on said bed, means for varying the tension of said resilient spring member, whereby the pressure exerted by said operating wheel against the work may be varied at will, and an adjustable stop carried by said base for limiting the motion of the operating wheel toward the work.

17. In a machine of the class described, in combination, a frame having continuous trackage thereon, platens mounted on said trackage for movement thereon, an operating head pedestal removably attached to said frame at the side of said platens, a substantially vertical supporting post adjustably held by said operating head pedestal, an operating wheel head mounted on said supporting post, said operating wheel head comprising a base adjustably attached to the top of said supporting post, a casing supported by said base, an operating wheel positioned for engaging work carried by said platens, said operating wheel having a drive shaft mounted in said casing, a motor supported by said base and connected in driving relation to said operating wheel drive shaft, and gearing contained within said casing for giving said operating wheel drive shaft a predetermined reciprocating motion as the same revolves under the driving action of said motor, said gearing being operative independently of the angular position of said operating wheel.

In testimony, that I claim the invention set forth above I have hereunto set my hand this 24th day of April, 1930.

CARL B. LARSON.