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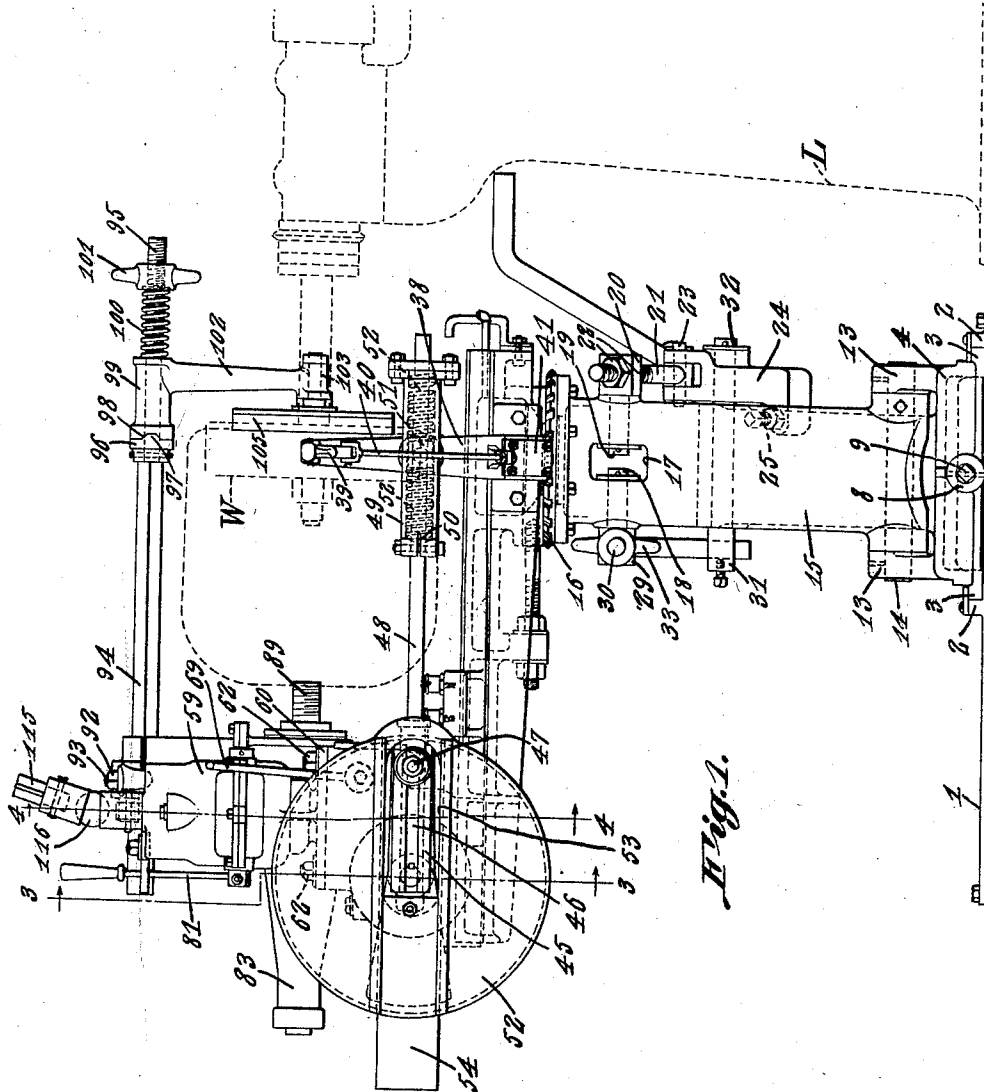
R. F. SALISBURY

1,509,904

POLISHING MACHINE

Filed Aug. 21, 1920

9 Sheets-Sheet 1



R. F. Salisbury Inventor

Witness

J. R. Smith

By *C. A. Snow & Co.*
Attorneys

Sept. 30, 1924.

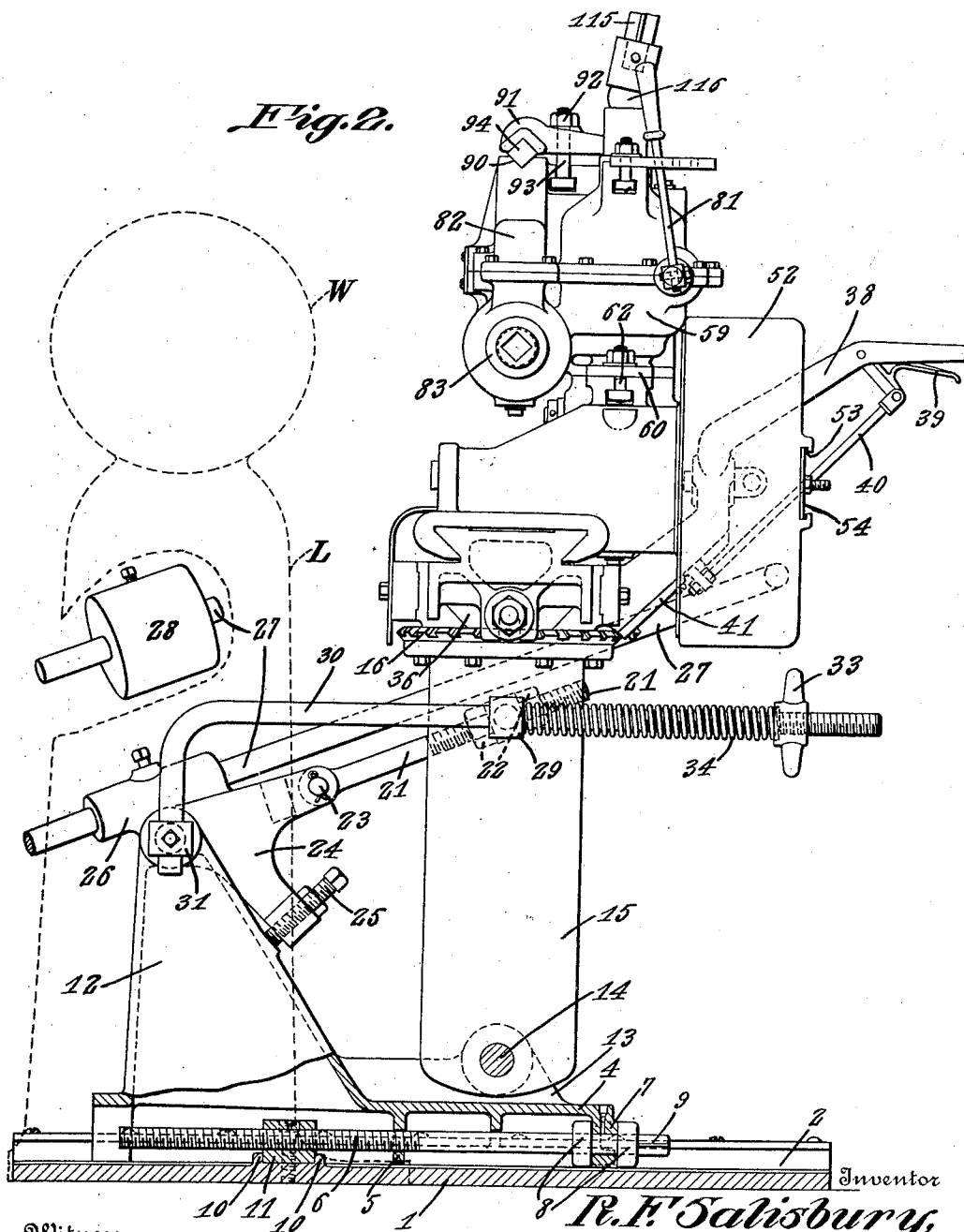
R. F. SALISBURY
POLISHING MACHINE

1,509,904

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9 Sheets-Sheet 2

Fig. 2.



Witness

J. R. Jones

By

C. A. Snow & Co.
Attorneys

Sept. 30, 1924.

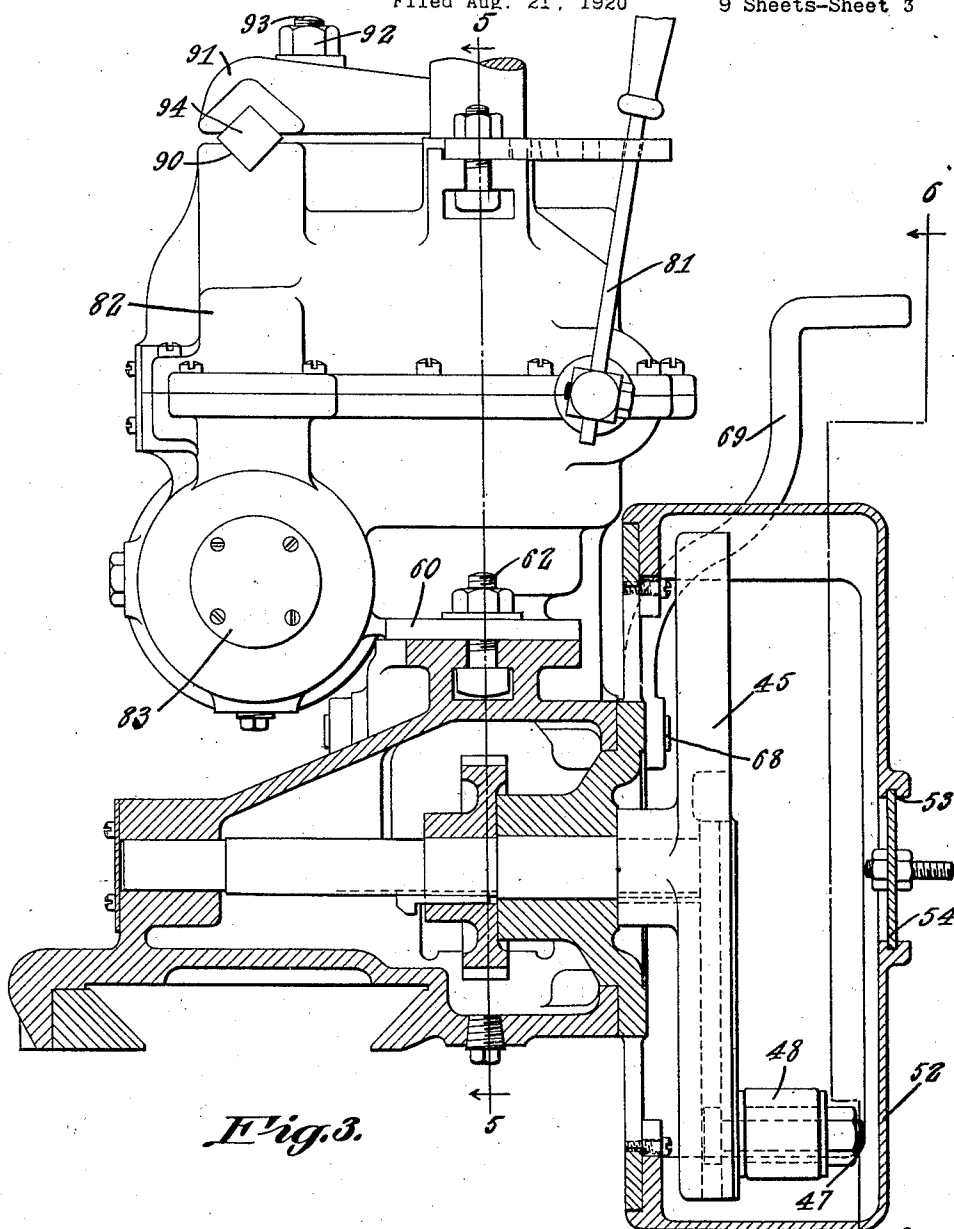
1,509,904

R. F. SALISBURY

POLISHING MACHINE

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9 Sheets-Sheet 3



Witness

J. R. Tomlin

By *C. A. Knowlton*
Attorneys

Sept. 30, 1924.

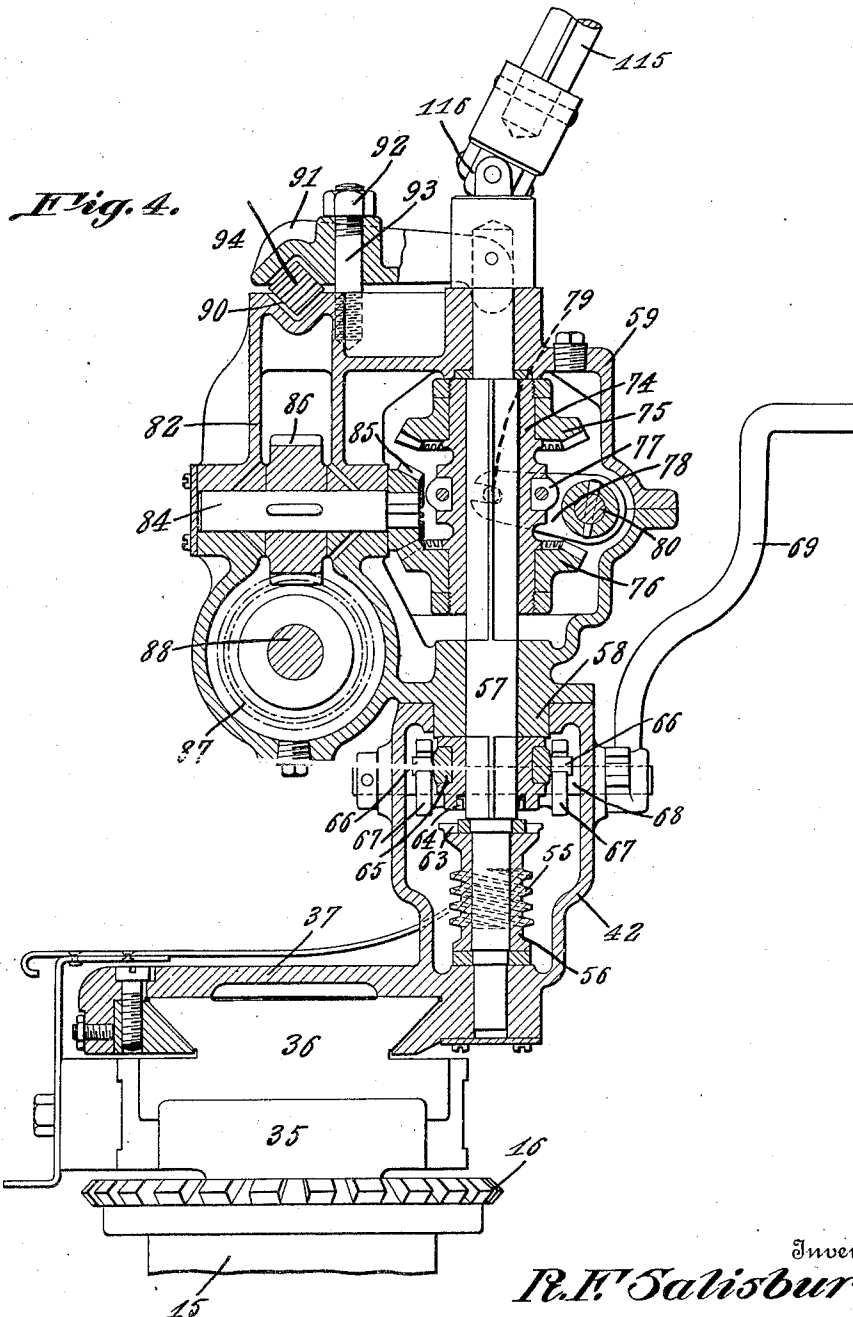
1,509,904

R. F. SALISBURY

POLISHING MACHINE

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9 Sheets-Sheet 4



Witness

J. R. Doolan

Inventor

R. F. Salisbury

By

C. A. Snow & Co.

Attorneys

Sept. 30, 1924.

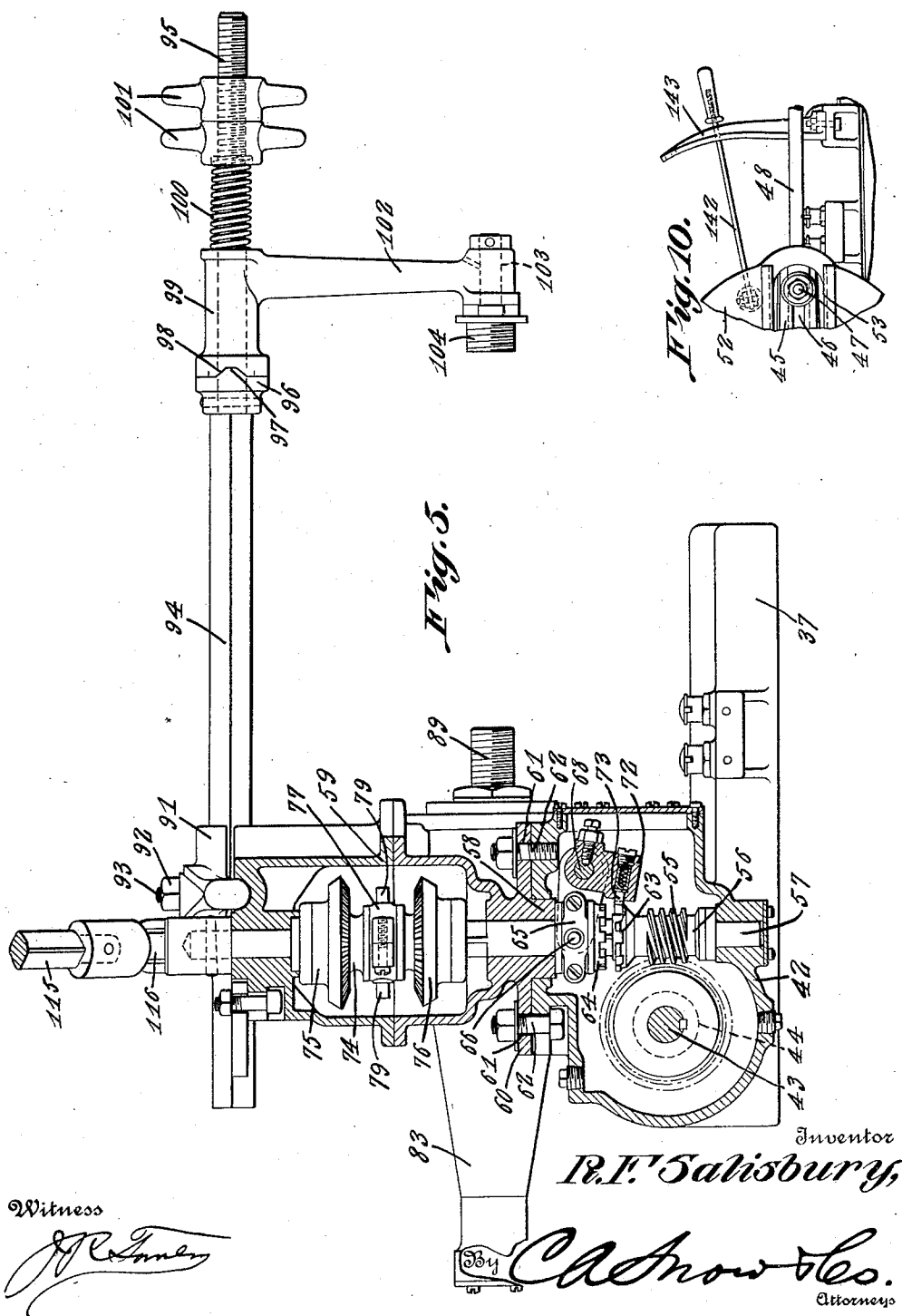
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POLISHING MACHINE

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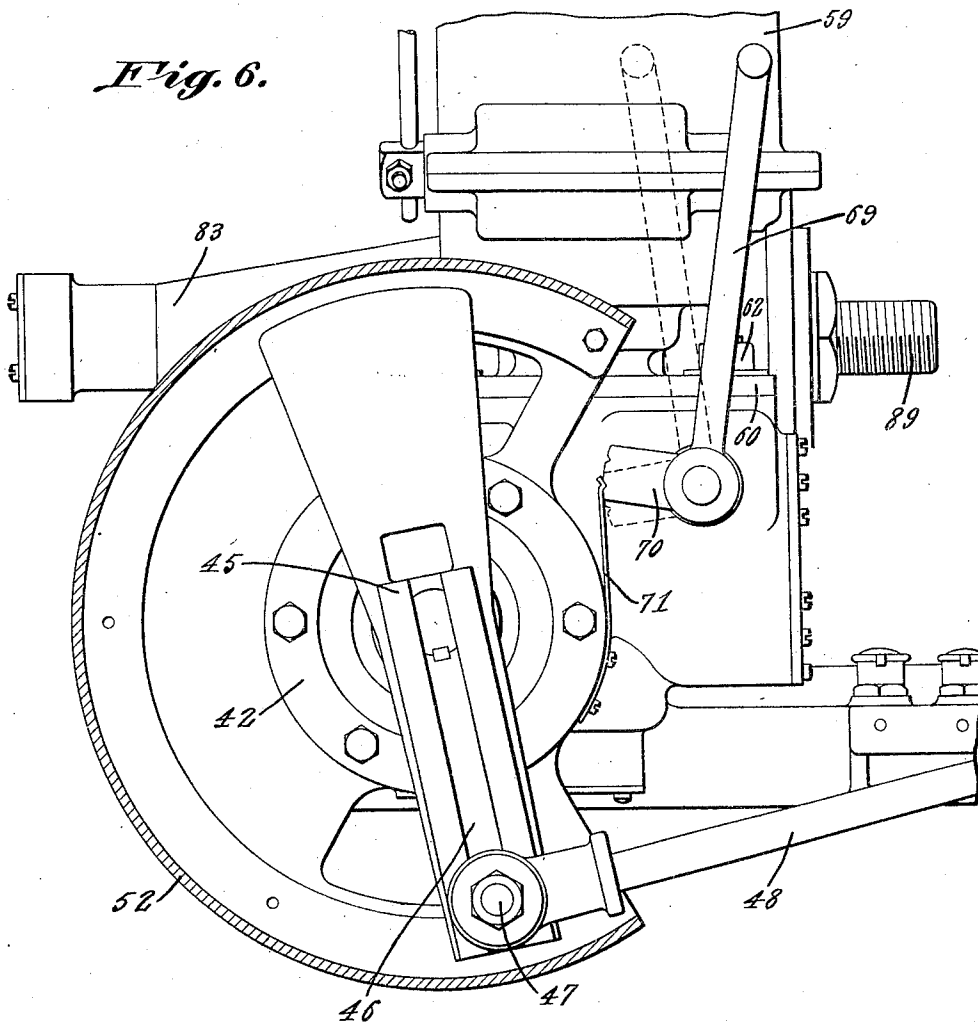
R. F. SALISBURY

1,509,904

POLISHING MACHINE

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9 Sheets-Sheet 6



R. F. Salisbury, Inventor

Witness

J. R. Anderson

By *C. A. Snow & Co.*
Attorneys

Sept. 30, 1924.

R. F. SALISBURY
POLISHING MACHINE

1,509,904

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9 Sheets-Sheet 7

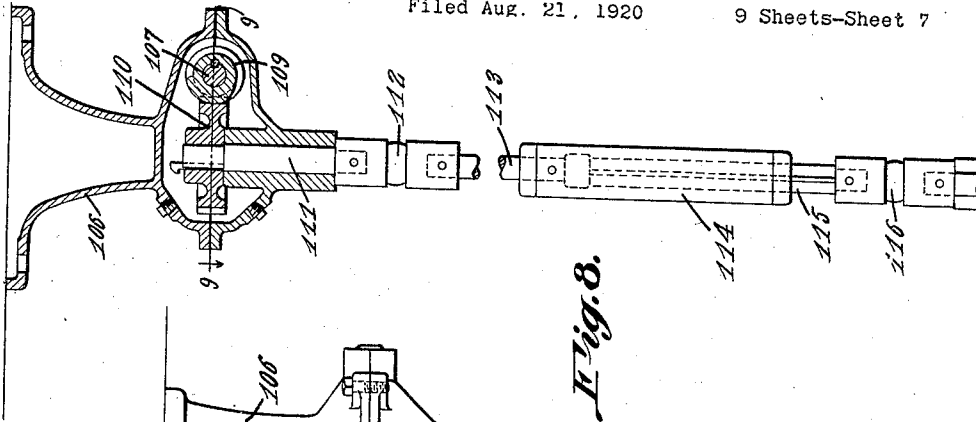


Fig. 8.

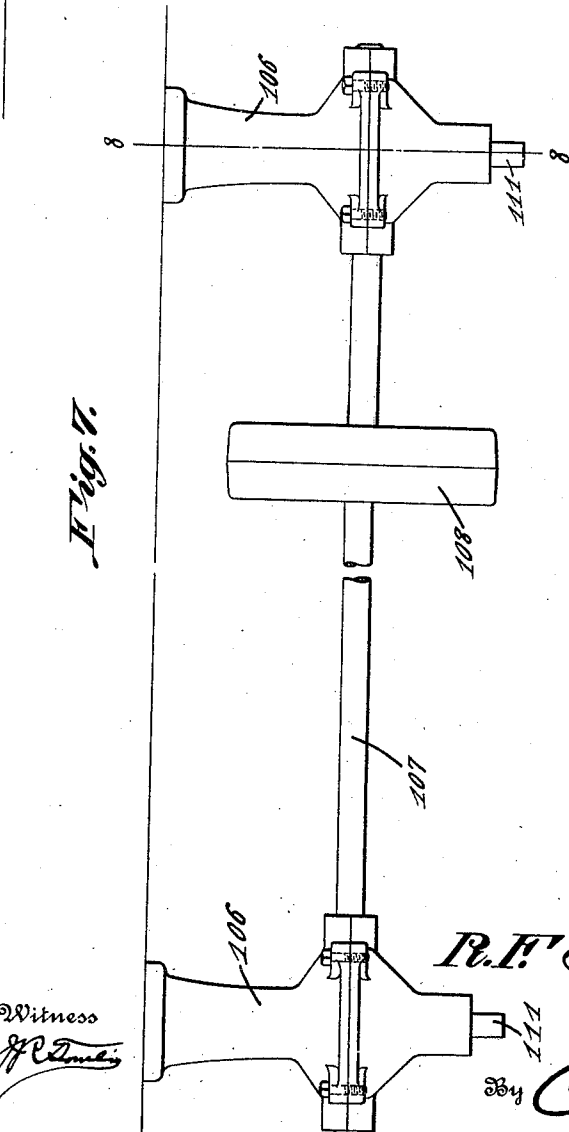


Fig. 7.

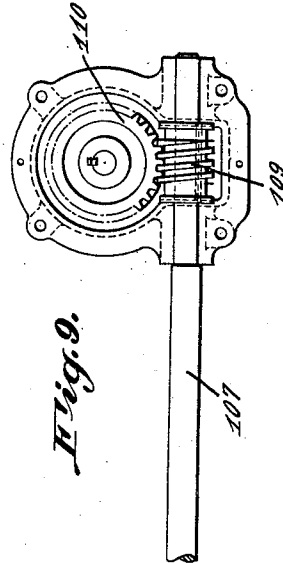


Fig. 9.

R. F. Salisbury, Inventor

By

Cashow & Co.
Attorneys

Witness
J. R. Smith

Sept. 30, 1924.

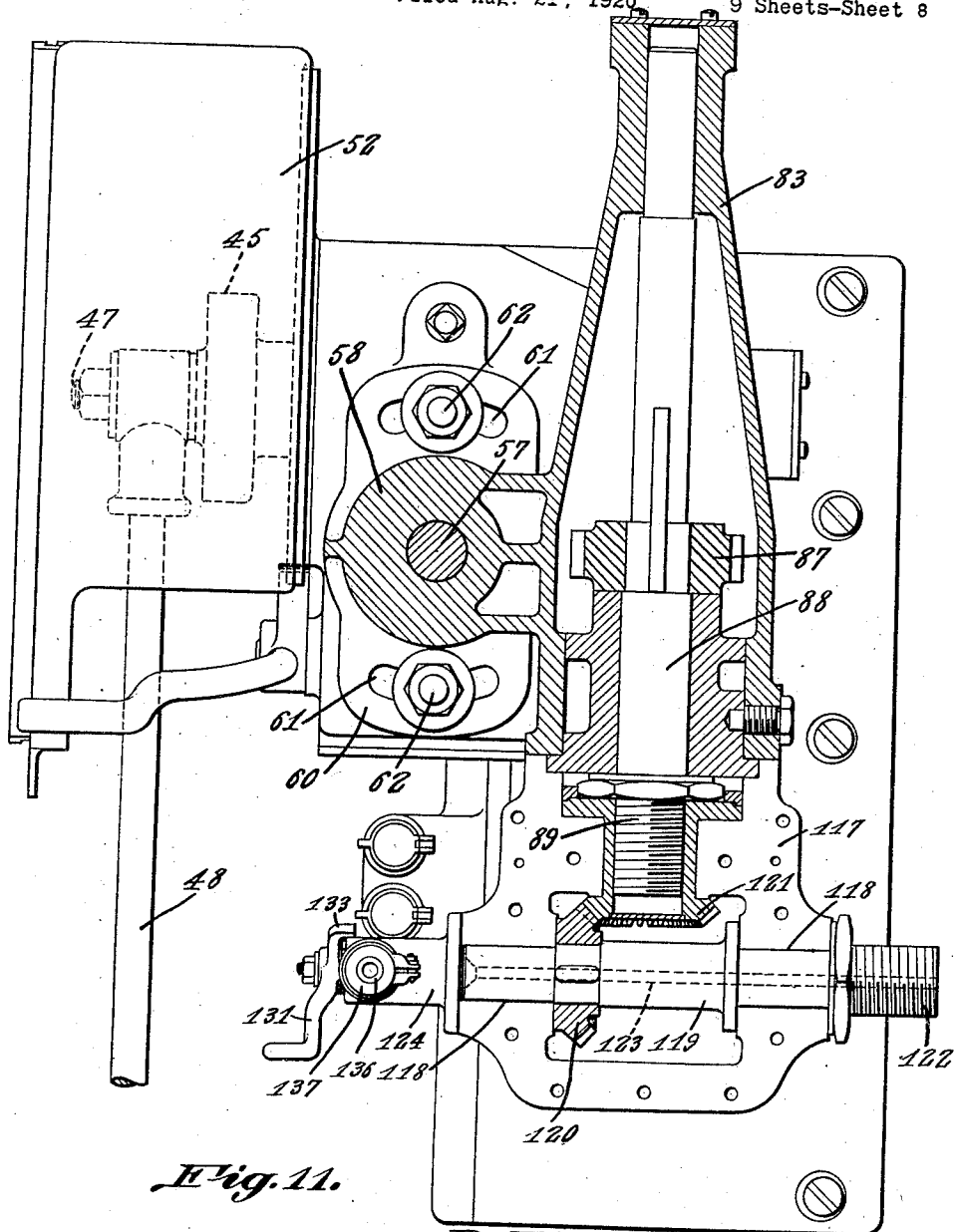
R. F. SALISBURY

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POLISHING MACHINE

Filed Aug. 21, 1920.

9 Sheets-Sheet 8



R. F. Salisbury, Inventor.

Witness

J. R. Smith

By

C. A. Snow & Co.
Attorneys

Sept. 30, 1924.

R. F. SALISBURY

1,509,904

POLISHING MACHINE

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9 Sheets-Sheet 9

Fig. 13.

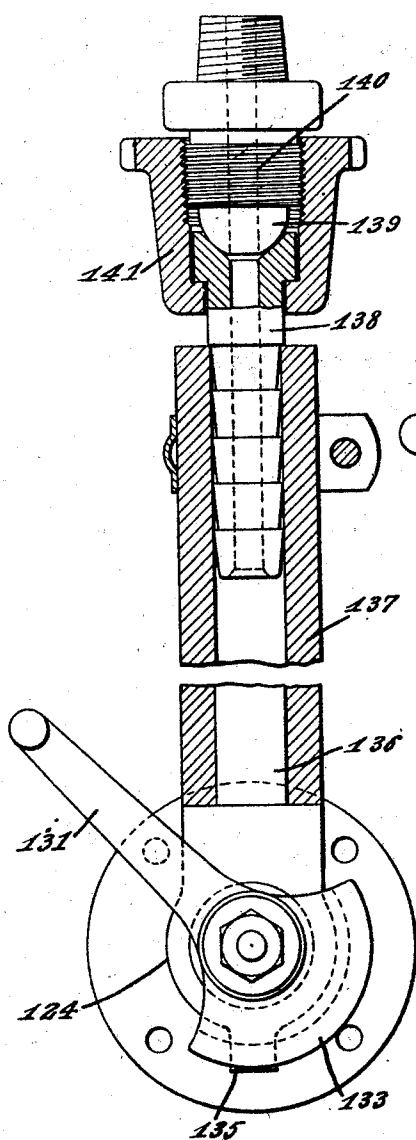
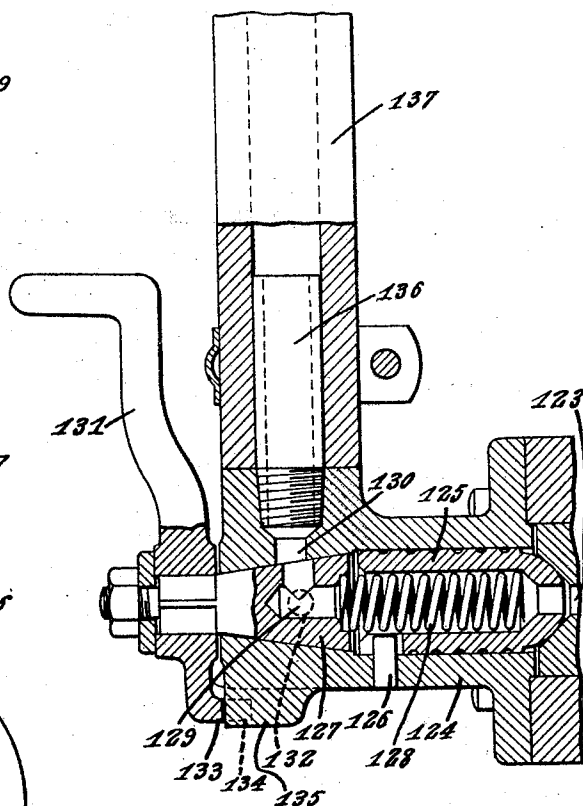


Fig. 12.



R. F. Salisbury, Inventor

Witness

J. R. Ames

By C. A. Snow & Co.
Attorneys

UNITED STATES PATENT OFFICE.

ROBERT F. SALISBURY, OF NEW KENSINGTON, PENNSYLVANIA, ASSIGNOR TO
ALUMINUM COMPANY OF AMERICA, OF PITTSBURGH, PENNSYLVANIA, A COR-
PORATION OF PENNSYLVANIA.

POLISHING MACHINE.

Application filed August 21, 1920. Serial No. 405,003.

To all whom it may concern:

Be it known that I, ROBERT F. SALISBURY, a citizen of the United States, residing at New Kensington, in the county of West-
moreland and State of Pennsylvania, have
invented a new and useful Polishing Ma-
chine, of which the following is a specifica-
tion.

This invention relates to a device espe-
cially designed for use in polishing metal
articles such as cooking utensils and the like,
one of the objects of the invention being to
provide simple and compact mechanism
adapted to be placed adjacent a polishing
wheel of the usual form and which is con-
stantly under the control of the operator
who, by manipulating certain levers pro-
vided for that purpose, can shift the device
so as to cause all parts of a straight, curved
or irregular surface to be brought properly
into contact with the polishing or buffing
element.

A further object is to provide a device of
this character which is normally locked
away from the buffing wheel but which can
be shifted readily so that the article being
treated will be held by gravity against said
wheel.

A still further object is to provide mecha-
nism whereby the article being treated can
be rotated either in the same direction as or
oppositely to the polishing or buffing wheel
and can be held stationary relative to the
longitudinal axis of said wheel or can be re-
ciprocated back and forth upon the wheel
during the rotation of the parts.

Another object is to provide a simple form
of holding device for properly retaining the
article on the device during the polishing or
buffing action, said holding device being
easily shiftable so as to permit the article to
be quickly placed in or removed from the
device.

Another object is to provide pneumati-
cally controlled means whereby shallow arti-
cles, such as utensil covers and the like, can
be held securely on the device during the
polishing or buffing operation, said means
being easily controlled for the purpose of
gripping the article or quickly releasing it.

Another object is to combine with a pol-
ishing apparatus of ordinary form, two de-
vices of the particular construction covered
by this application, one machine being lo-
cated at each end thereof so that one opera-

tor can take care of both, it thus being pos-
sible to apply and adjust one article on one
device while the article previously applied
to the other device is being polished.

A further object is to provide simple and
efficient mechanism for transmitting motion
to the devices from an overhead shaft and
without interfering with the various move-
ments of the mechanism.

Another object is to provide the device
with an attachment whereby an article can
be rotated in a plane parallel with the axis
of rotation of the buffing wheel, thereby to
allow for the polishing of covers and the
like.

A still further object is to provide a com-
pact arrangement of gears so housed as to
be capable of running in oil, thereby reduc-
ing wear to the minimum.

With the foregoing and other objects in
view, the invention consists of certain novel
details of construction and combinations of
parts hereinafter more fully described and
pointed out in the claims, it being under-
stood that various changes may be made in
the construction and arrangement of the
parts without departing from the spirit of
the invention as set forth in the appended
claims.

In the accompanying drawings the pre-
ferred forms of the invention have been
shown.

In said drawings—

Figure 1 is a front elevation of the device,
the adjacent end portion of a standard pol-
ishing wheel being shown by dotted lines.

Figure 2 is an elevation of the left side of
the device as viewed in Figure 1, a portion of
the counterbalance lever being broken away
and positioned above and adjacent said lever,
and the polishing wheel being indicated gen-
erally by dotted lines.

Figure 3 is an enlarged section through
the slidable head, said section being taken
on line 3—3, Figure 1 and showing the spin-
dle housing in elevation.

Figure 4 is an enlarged section on line
4—4, Figure 1, the adjustable crank of the
reciprocating mechanism and the housing
therefor being removed.

Figure 5 is a section on line 5—5, Fig-
ure 3.

Figure 6 is a section on line 6—6, Fig-
ure 3.

Figure 7 is an elevation of the overhead

drive shaft and its hangers used for the purpose of operating two devices at the respective ends of a polishing apparatus.

Figure 8 is a vertical section through one of the hangers on line 8—8, Figure 7 and showing the telescopic shaft depending therefrom.

Figure 9 is a section on line 9—9, Figure 8.

Figure 10 is an elevation of a portion of the device and showing a modified lever arrangement for controlling the connection between the adjustable crank of the reciprocating mechanism and the drive shaft.

Figure 11 is a horizontal section through the spindle housing and showing adjacent parts of the device in plan, there being an angle attachment coupled to the spindle.

Figure 12 is an enlarged section through the controlling valve of the pneumatic gripping mechanism.

Figure 13 is an enlarged view showing the flexible hose and its connections.

Referring to the figures by characters of reference 1 designates a base plate adapted to be bolted or otherwise fastened to the floor adjacent one end of a standard polishing apparatus such as has been indicated generally by dotted lines at L, this apparatus being provided with the usual polishing or buffing head or wheel W. As before stated this apparatus is double with a wheel W at each end and as one polishing device is to be used in connection with each wheel there will be one plate 1 adjacent each end of the apparatus. As both of these plates and the devices mounted thereon are of the same construction it will be necessary to describe and illustrate one of them only.

Formed on or secured to the plate 1 are parallel guide ribs 2 which overhang laterally extending flanges 3 projecting from the sides of a hollow base 4 mounted to slide upon the plate 1. An ear 5 is formed within the base 4 and constitutes a bearing for an adjusting screw 6 one end portion of which is swivelled within an end flange 7 depending from the base, said screw being held against longitudinal movement relative to the base by collars 8 at opposite sides of the flange 7. The projecting end of the screw 6 is preferably made angular as shown at 9 so that by applying a wrench or other suitable tool thereto the screw can be rotated in the base. Transverse ribs 10 are formed on or secured to the plate 1 and mounted between these ribs and secured to the base 1 is a block 11 engaged by the screw 6 which extends through it. Thus it will be seen that by rotating the screw the base 4 can be shifted bodily toward or from the axis of rotation of the wheel W and will carry with it the entire device mounted thereon.

Extending from the base 4 is a standard 12 located adjacent one end of the base, and spaced ears 13 are carried by the base near

its other end. A pivot pin 14 connects these ears and extends through the lower end of a pedestal 15 to the upper end of which is bolted or otherwise secured a concentric circular rack 16. An opening 17 extends through the pedestal near the upper end thereof and swivelled within this pedestal respectively of the pedestal are pins 18 and 19 respectively. The pin 19 has a head at its outer end in which is secured one end portion of a link 21, said link being held securely to the head by nuts 22 engaging the link at opposite sides of the head. Said link is pivotally secured, as at 23, to one arm of a bell crank lever 24 which is pivotally mounted on the upper end of the standard 12. The other arm of this bell crank lever extends downwardly and carries a stop screw 25 adapted to come against the standard so as to limit the movement of the bell crank lever in one direction. This screw 25 can be so adjusted as to contact with the standard 12 when the pivot point 23 is slightly below the dead center, thereby to prevent the pedestal 15 and the parts carried thereby from swinging to the left toward the apparatus L as viewed in Figure 2. A sleeve 26 is carried by the bell crank lever 24 and has a lever 27 adjustably mounted therein, there being a counterbalancing weight 28 on one end of the lever.

The pin 18 has a head 29 at its outer end in which is slidably mounted a rod 30 one end of which is downturned and secured within the head 31 of the pin 32 on which the bell crank lever 24 is pivotally mounted. The free end portion of the rod 30 is screw threaded and is engaged by a nut 33. A coiled spring 34 is mounted on the rod between the nut 33 and the head 29 and, when the pedestal 15 is locked in upstanding position, as shown in Figure 2, this spring is under compression. When the upper end of lever 27 is pulled upwardly the pivot point 23 is elevated above the dead center and spring 34 is promptly released so as to thrust against the head 29 and swing the pedestal 15 laterally or backwardly toward the wheel W. The movement of lever 27 by the operator is facilitated by the weight or counterbalance 28.

The pedestal 15 is provided at its upper end with a head 35 which projects above the circular rack 16 and is concentric therewith. This head is mounted for rotation within the pedestal and carries a dove-tailed guide 36. A slide 37 is mounted for reciprocation on this guide and the said guide together with the slide and the parts carried thereby can be readily rotated relative to the pedestal 15 by means of a handle 38 which is fixedly connected to the guide and extends upwardly and outwardly therefrom. A hand lever 39 is pivotally mounted on the handle 38 and is

connected by a rod 40 to a gravity latch 41 adapted to drop into any one of the notches in the circular rack 16. It will be apparent that by pulling upwardly on the lever 39 the latch 41 can be disengaged from the rack 16 and the guide 36 and the slide 37 can be easily rotated about the axis of the pedestal 15 by means of the handle 38.

Formed upon the slide 37 is a housing 42 in which is journaled a transverse shaft 43 provided with a worm gear 44. One end of this shaft 43 projects laterally beyond the housing 42 and is keyed or otherwise secured to a crank arm 45 having a longitudinal slot 46. A wrist pin 47 is adjustably mounted within this slot and is pivotally connected to a pitman 48. A sleeve 49 is mounted on this pitman and is held adjustably thereto by clamping one end of the sleeve, which is split, upon the pitman as shown at 50 in Figure 1. Both ends of the sleeve are closed and projecting into the sleeve is an ear indicated by dotted lines at 51 on which the sleeve will slide. Springs 52 are arranged within the sleeve at opposite sides of this ear 51. Thus it will be seen that during the rotation of the crank arm 45 the pitman 48, which is yieldingly anchored to the ear 51 on the lever 38 will cause the slide 37 to reciprocate upon the guide 36. Obviously by adjusting the wrist pin 47 in the slot 46 the extent of this reciprocating motion can be regulated. A guard or casing 52 serves to house the crank arm 45 and this casing may be provided with a slot 53 whereby access can be had to the wrist pin 47 for the purpose of adjusting it. A slide 54 may be employed for closing this slot.

The worm gear 44 on shaft 43 meshes with a worm 55 carried by a spool 56. See Figure 5. This spool is loosely mounted on a vertical shaft 57 which extends upwardly through and beyond the casing 42 and also through a boss 58 extending into the top of the casing 42 from the bottom of a head 59. This head is mounted for rotation on the casing 42 and has flanges 60 provided with arcuate slots 61 (see Figure 11) into which extend clamping bolts 62. By loosening these bolts the head 59 can be rotated with the boss 58 constituting its pivot. The shaft 57 projects entirely through the head and is adapted to be driven in the manner herein-after pointed out.

The spool 56 is provided at one end with a clutch member 63 adapted to be engaged by another clutch member 64 which is feathered therewith. A split collar 65 embraces the clutch member 64 which is free to rotate therein. This collar has oppositely extending projections 66 engaged by a fork 67. This fork is carried by a transverse shaft 68 journaled in the casing 42 close to the top of said casing and a lever 69 is connected

to one of the projecting ends of this shaft. A notched wing 70 rotates with this lever and is frictionally engaged by the end portion of a spring 71 attached to the outer surface of the housing or casing 42. Thus, as shown especially in Figure 6, the lever 69 will be held in either of two positions by the spring 71. When the lever is in one position the clutch member 64 is shifted downwardly into engagement with the clutch member 63 so as to couple the spool 56 to the shaft 57. When the lever 69 is in its other position the two clutch members are uncoupled. For the purpose of locking the spool 56 against rotation while the clutch members are uncoupled, an arm 72 is secured to the shaft 68 and carries a spring pressed locking pin 73 so positioned that when the fork 67 is raised to uncouple the clutch members, the arm 72 is swung inwardly to project the pin 73 into engagement with the clutch member 63. During the movement of the lever 69 to bring the clutch members into engagement with each other the pin 73 is shifted away from the clutch member 63.

Feathered on the shaft 57 and within the head 59 is a sleeve 74 to the end portions of which are secured oppositely disposed bevel gears 75 and 76. The sleeve 74 rotates within a split collar 77 and this collar, in turn, is held against rotation by a fork 78 which engages projections 79 extending in opposite directions from the collar. This fork is secured to a shaft 80 extending transversely through the head 59 and provided at one end with a lever 81 whereby the shaft can be rotated in either direction for the purpose of shifting the sleeve 74 upwardly or downwardly on the shaft 57 while rotating therewith.

The head 59 is provided on one side with a hollow extension 82 arranged above a substantially conical spindle housing 83. A transverse shaft 84 is journaled in the extension 82 and above the spindle housing and secured to the inner end of this shaft 84 is a bevel gear 85 disposed between the gears 75 and 76. Thus it will be seen that when lever 81 is moved to one extreme position the gear 76 will be brought into mesh with the gear 85 whereas when the lever is moved to its other extreme position the gear 75 will be brought into mesh with gear 85. When lever 81 is in its intermediate or neutral position neither of the gears 75 and 76 will mesh with the gear 85 and, consequently, the shaft 84 will not be operated.

Secured to the shaft 84 and within the extension 82 is a worm gear 86 which constantly meshes with a worm gear 87 secured to a spindle 88 which extends longitudinally within the housing 83 and has a screw threaded end 89 projecting from one end of said housing. This threaded end, under ordinary conditions, is adapted to engage a

block to be inserted into the article to be buffed or polished although, under some conditions, and as will be hereinafter explained, it can be used in connection with a right angle attachment.

Formed in the upper end of the extension 82 is an angular recess 90 and mounted on the head 59 and extending over this recess is a clamp 91 adapted to be held to the head 59 by an adjusting nut 92 engaging a threaded stem 93. A rod 94 which is angular in cross section is adjustably held in the recess 90 by the clamp 91 and that end portion of the rod remote from the clamp is made round and is screw threaded as shown at 95. A collar 96 is secured to the rod and has a rib 97 on one face adapted to project into a groove 98 formed in one end of a sleeve 99. A spring 100 is mounted on the rod and bears against this sleeve so as to press it against the collar 96. Nuts 101 engage the rod and constitute means for regulating the compression of the spring 100. A hanger 102 extends from the sleeve 99 and has a small shaft 103 journaled therein and provided with a screw threaded head 104 to which is detachably secured a back block 105. The center of this block is in line with the axis of the spindle 88 when the hanger 102 is in its normal position. By pulling the hanger 102 against the spring 100 the sleeve 99 can be disengaged from the rib 97 and said hanger 102 with the block 105 can be swung laterally so as to allow a utensil or other article to be placed on the holding block (not shown) carried by the threaded end 89 of the spindle.

By loosening the clamp 91 the rod 94 can be shifted longitudinally so as to adjust the back block 105 to the article to be polished.

A hanger 106 in the form of a housing is adapted to be suspended at a suitable point above the device and forms a bearing for a drive shaft 107 carrying a pulley 108. This pulley is fixed to the shaft and it is to be understood that, if desired, a loose pulley can also be mounted on the shaft to support the drive belt (not shown), when it is not desired to operate the shaft 107. Mounted on that portion of the shaft 107 within the hanger 106 is a worm 109 which meshes with a worm gear 110 secured to a vertical shaft 111 journaled in the bottom portion of the hanger. A universal joint 112 connects this shaft to one end of an extensible shaft 113. This extensible shaft includes a sleeve 114 in which is feathered a shaft section 115 connected by a universal joint 116 to the upper end of the shaft 57. As it is intended to use two devices, one located at each end of the polishing apparatus, a portion of which has been shown at L, it is desirable to have two hangers 106 each of which contains gearing such as hereinbefore described whereby motion is transmitted from the

shaft 107 through extensible shafts to the respective devices.

In using the device a chuck or holding block suitable for the work to be polished is placed on the threaded end 89 of the spindle and the rod 94 is adjusted so as to cause the block 105 to exert sufficient pressure on the bottom of the work to hold it on its block or chuck. By means of the gearing shown in Figure 4 the work can be caused to rotate either with or opposite to the polishing wheel W. If the polishing wheel is of a width equal to or greater than the side of a cylindrical piece of work it will not be necessary to operate the crank arm 45 and the same can be left uncoupled. If, however, the work is of such size that the polishing wheel will not extend the full length of the side thereof, the crank arm 45 can be coupled up as hereinbefore described so that the slide 37 will reciprocate and cause the work to move back and forth across the polishing wheel with which it contacts. The extent of this reciprocation can be controlled by means of the adjustable wrist pin 47. For the purpose of bringing the work into proper relation with the polishing wheel should it be found that the work is too far to the left or too the right of the wheel the split portion 50 of sleeve 49 is provided. The clamp at 50 is first loosened, pitman 48 is moved to the proper position in sleeve 49 and clamp at 50 is then tightened on pitman 48. This controls the position of the reciprocating parts longitudinally. The manner of bringing the work against the wheel has already been described, such operation being effected by manipulation of the lever 27.

Should the work have a curved side wall to be polished the slide 37 can be shifted so that the center of the curve of the side wall on the work will be approximately over the center of the pedestal 15. After the mechanism has been coupled so as to cause the work to rotate the operator can grasp the handle or lever 27 in one hand and the handle 38 in the other. By then lifting the latch 41 the head can be moved about the center of the pedestal and at the same time the operator can move the lever 27, thus to give the work a compound movement which will insure the polishing of all portions of the curved surface being acted on. If the work has a cylindrical or tapered formation in addition to the curved surface said portion can be polished either before or after the polishing of the curved surface.

When it is desired to polish the bottom of an article it is preferable to use an angle attachment such as shown particularly in Figure 11. This angle attachment includes a base 117 adapted to be fastened to the casing 42 or to the slide 37 and ar-

ranged on the base are bearings 118 carrying a transverse shaft 119. A gear 120 is secured to this shaft and meshes with a gear 121 secured to the threaded end 89 of the spindle 88. The chuck or block to which the work is to be connected is fastened to the threaded end 122 of shaft 119 and by causing the slide 37 to reciprocate the work can be rotated about an axis at right angles to the axis of rotation of the wheel W and, at the same time, can be moved back and forth across said wheel.

Where a shallow article is to be polished, such as a utensil cover, it is a difficult matter to provide a chuck which will hold it properly in position. Under these conditions an air passage 123 is formed in the shaft 119 and a suction head, not shown, is adapted to be fastened to the threaded end 122 of the shaft. The other end of the shaft opens into a valve casing 124 and in this casing is arranged a tubular floating member 125 having each end open and which is held against rotation by a pin 126. See Figure 12. A tapered valve 127 is mounted in the casing and this valve, as well as the floating member 125, is held to its seat by a spring 128. Valve 127 has an angular passage 129 which constantly communicates with the interior of the member 125 and is adapted to move into and out of communication with a suction port 130. A lever 131 is connected to the valve and is adapted to be moved to either of two positions so as to bring the passage 129 either in communication with the exhaust port 130 or with a vent indicated by dotted lines at 132. Lever 131 has a wing 133 extending therefrom and provided with spaced lugs 134 adapted to come against a stop projection 135 on the valve casing. Thus the movement of the lever and its valve is limited.

A nipple 136 extends from the port 130 and has one end of a flexible hose 137 clamped upon it. The other end of this hose receives a tubular stem 138 one end of which bears against a rounded extension 139 on a nipple 140 adapted to extend from a suction pipe not shown. A coupling 141 engages this nipple and serves to clamp the tubular member 138 against the rounded extension 139.

By manipulating the valve 127 a suction can be established through the passage 123 so that when an article is placed against a suction head on the end 122 of shaft 119 said article will be gripped tightly during the polishing operation. In order to release the article it is merely necessary to rotate the valve so as to cut off the suction and place the passage 129 in communication with the outlet 132.

While the clutch operating shaft 68 is preferably operated by the lever 69, as here-

inbefore described, it is to be understood that, if desired, a lever 142 can be extended from said shaft as shown in Figure 10 and placed in engagement with a notched rack 143 extending upwardly from the slide 37.

It will be noted that the various gears are contained within closed housings which can be filled with a lubricant so that the parts will operate without objectionable friction.

By providing two devices such as described one operator can handle both of them, it being possible to remove a polished article from one device, replace it with another, and adjust the device to the polishing wheel while another article is being acted on by the polishing wheel at the other end of the apparatus.

What is claimed is:

1. The combination with a polishing wheel, of a work holding device having a portion tiltably mounted, a standard, pivotally connected members constituting a toggle and connected to the standard and tiltable portion of the device for holding the device normally against movement, means under the control of the operator for shifting said members out of normal position and resilient means for automatically tilting the tiltable portion of the device toward the wheel when the members are shifted from normal position.

2. The combination with a polishing lathe, of a work holding device having a portion tiltably mounted, pivotally connected members constituting a toggle for holding the machine normally against movement, a counterbalance lever connected to one of said members, and spring operated means for automatically swinging the tiltable portion of the device toward the lathe when the members are moved out of normal positions.

3. The combination with a polishing lathe, of a base, means for sliding said base relative to the lathe, a work holding device having a portion tiltably mounted on the base, a standard on the base, pivotally connected members constituting a toggle joining the device to the standard, adjustable means for controlling the movement of said members in one direction with their point of connection past the dead center, means under the control of an operator for shifting said members, and yielding means for automatically swinging the tiltable portion toward the lathe when said members are shifted.

4. A work holding device for use in connection with polishing lathes, including a base having an upstanding portion, a pedestal tiltably mounted on the base, a lever fulcrumed on the upstanding portion, a link connecting said lever to the pedestal, adjustable means carried by the lever for limiting its movement in one direction, and

an operating lever connected to the first mentioned lever.

5. A work holding device for use in connection with polishing lathes, comprising a pedestal tiltably mounted, a bell crank lever, a support for said lever, a link connection between one arm of the bell crank lever and the pedestal, means cooperating with the other arm of the bell crank lever for limiting the movement thereof in one direction, and an operating lever adjustably connected to the bell crank lever.

6. A work holding device for use in connection with polishing lathes, including a tiltably supported pedestal, a bell crank lever, a support therefor, a link connection between said lever and the pedestal, means cooperating with the bell crank lever for limiting its movement in one direction, a lever for actuating said bell crank lever to swing the pedestal in one direction, a rod anchored adjacent one end and slidably engaged by the pedestal and a spring mounted on the rod for shifting the pedestal after the bell crank lever and link have been moved to a predetermined position.

7. A work holding device for use in connection with polishing lathes, comprising a tiltably mounted pedestal, means for swinging said pedestal, a head mounted for rotation on the pedestal, means for locking said head against rotation, a handle for rotating the head while unlocked, a spindle movable with the head, and means for actuating the spindle.

8. A work holding device for use in connection with polishing lathes, including a pedestal, means for shifting the pedestal, a head on the pedestal, means for rotating the head, a slide upon the head, a crank revoluble on the slide, a pitman connected to the head and adjustably connected to the crank, means for rotating the crank to reciprocate the slide, and a spindle carried by the slide.

9. A work holding device for use in connection with polishing lathes, including a movably supported head, means for rotating the head, a slide on the head, a shaft journaled on the slide, a crank upon the shaft, a pitman connected to the head and adjustably attached to the crank, an operating shaft extending upwardly and carried by the slide, means under the control of the operator for transmitting motion from said upwardly extending shaft to the crank shaft, and means movable with the slide for attachment to the work to be polished.

10. A work holding device for use in connection with polishing lathes, including a head, a slide, an operating shaft journaled in the slide, a crank shaft, upon the slide, means operated by the crank shaft for reciprocating the slide, mechanism for transmitting motion from the operating shaft to

the crank shaft, cooperating clutch members for coupling said mechanism to the operating shaft, means for shifting one of the clutch members into and out of engagement with the other clutch member, and means operated by the movement of one of the clutch members for engaging and holding the other clutch member against rotation with the operating shaft.

11. A work holding device for use in connection with polishing lathes including a spindle, angularly adjustable means for rotating the spindle, a tubular transverse shaft extending at an angle to the spindle, means for transmitting motion from the spindle to said tubular shaft, a suction tube in communication with the tubular shaft and a valve for controlling suction through the shaft.

12. A work holding device for use in connection with polishing lathes including a spindle angularly adjustable, means for rotating the spindle in either direction, a work holding shaft disposed at an angle to the spindle, and means for transmitting motion to said shaft from the spindle.

13. A work holding device for use in connection with polishing lathes including a head mounted for angular adjustment, a spindle journaled therein, a shaft disposed at an angle to the spindle, means for creating a suction through the shaft, and means for transmitting motion to the shaft from the spindle.

14. The combination with a polishing wheel of a work holding device having a pivotally mounted pedestal, pivotally connected members forming a toggle for normally holding the pedestal from movement towards the said wheel, and means under the control of the operator for shifting the said members to tilt the pedestal toward the wheel.

15. The combination with a polishing wheel of a work holding device comprising a supporting base plate, a base adjustably mounted thereon for lateral movement towards and away from the said wheel, a tiltably pedestal pivoted to the base, means for limiting the swinging movement of the pedestal towards the wheel, means for selectively swinging the said pedestal towards and away from the wheel, a head rotatably mounted directly on the pedestal, a spindle movable with the head, and means for actuating the spindle.

16. The combination with a polishing wheel of a work holding device comprising a tiltably pedestal, a rotatable head mounted directly on the pedestal, means for rotating the head, means for limiting the movement of the pedestal towards the wheel, means for selectively swinging the pedestal towards and from the wheel, a slide superposed upon said head, a spindle carried by

and movable with the slide, means for rotating the spindle, and operative connections between the last-named means and the said head for reciprocating the slide superposed upon the head.

17. The combination with a polishing wheel of a work holding device comprising a pedestal, means for moving the pedestal towards and from the wheel, a rotatable head on the pedestal, means for rotating the head, a slide carried by the head, a revoluble crank on the slide, a pitman having its opposite extremities operatively connected to the crank and said head, a spindle carried by the slide, and means carried by said slide for rotating the crank to reciprocate the slide, and operative connections between the last-named means and the spindle for rotating the same.

18. The combination with a polishing wheel of a work holding device comprising a base, a hollow pedestal tiltably mounted thereon, a circular rack adjacent the upper portion of the pedestal, a rotatable head journaled in the bore of the pedestal, means carried by the head and operatively engaging the rack for locking the head against angular movement with respect to the pedestal, a slide mounted on the head, a spindle carried by the slide, and means mounted upon and carried by the slide for rotating the spindle, and operative connections between the first-named means and head for reciprocating the slide.

19. The combination with a polishing wheel of a work holding device comprising a base, a pedestal tiltably attached thereto, a slide mounted on the pedestal, a gear housing carried by the slide, said housing consisting of a lower section and an upper sec-

tion superposed thereon, the upper section being operatively connected to the lower section and angularly adjustable with respect thereto, a driving shaft extending through both said sections and around which the upper section is revoluble, a rotatable spindle journaled in and bodily movable with the upper section, operative connections between the driving shaft and said spindle, and operative connections between said shaft and the pedestal for reciprocating the slide.

20. The combination with a polishing wheel of a work holding device comprising a pedestal, a rotatable head mounted thereon, a reciprocating slide slidable on the said head, a gear housing carried by the slide, said housing consisting of a lower section and an upper section, the lower section being provided with a circular opening at its top, a circular boss on the upper section fitting within the said opening whereby to render the sections adjustable angularly with respect to each other, means for selectively locking the sections against relative movement, a driving shaft extending through both said sections and passing through the said boss, a spindle journaled in the upper section and disposed in vertical alignment with the said pedestal, operative connections between the driving shaft and spindle, and means operatively connecting the said shaft and head to reciprocate the slide.

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

ROBERT F. SALISBURY

Witnesses:

JOS. T. WEINZIERL,

JOHN D. MATTSON.