May 13, 1930. G. W. ANDREWS, JR 1,758,100

MACHINE FOR LAPPING AND THE LIKE

Filed Feb. 4, 1928

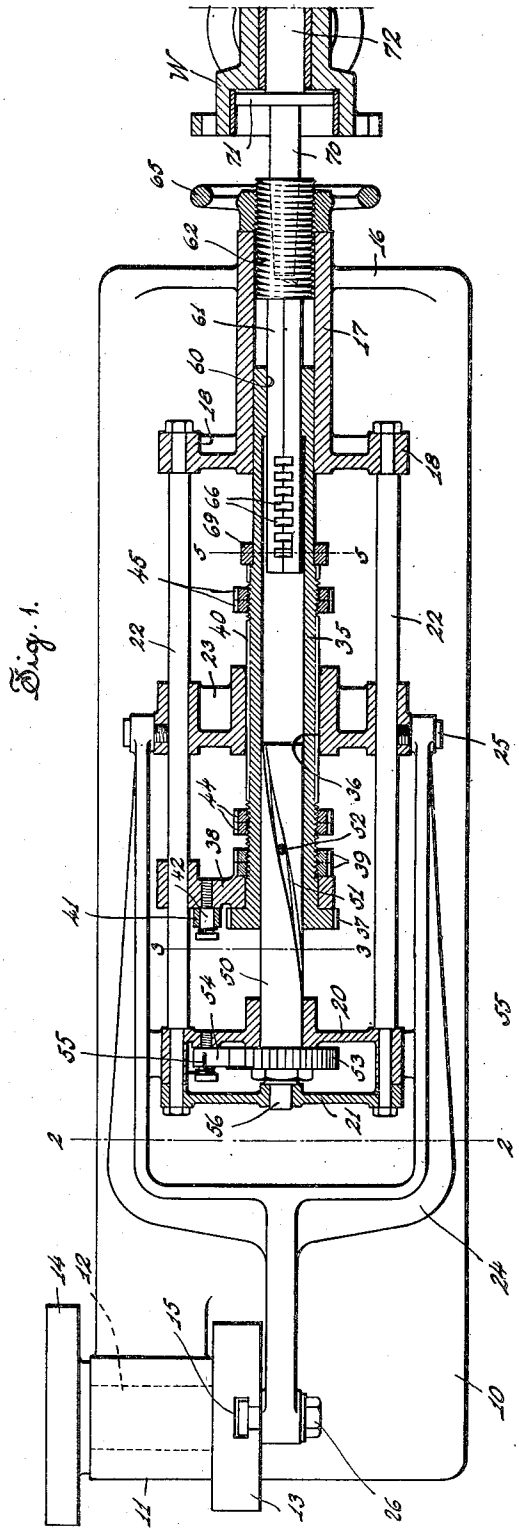


Fig. 1.

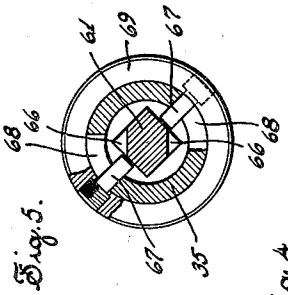


Fig. 5.

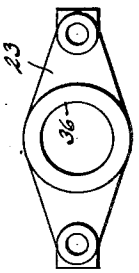


Fig. 4.

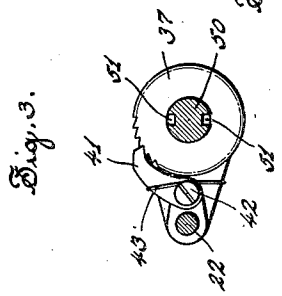


Fig. 3.

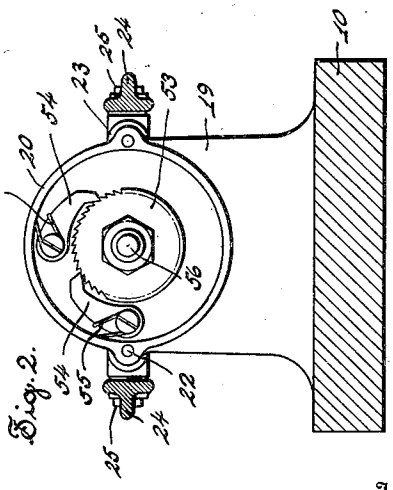


Fig. 2.

Inventor

George W. Andrews Jr.

By H. Clay Linkey.

his Attorney

Patented May 13, 1930 1,758,100

UNITED STATES PATENT OFFICE

GEORGE W. ANDREWS, JR., OF VERNON, CONNECTICUT

MACHINE FOR LAPPING AND THE LIKE

Application filed February 4, 1928. Serial No. 251,863.

This invention relates to a machine for use in lapping, reaming, grinding or polishing pieces of work and finds peculiar application in the operation of lapping cylindrical surfaces such as the cylindrical chambers of air valves and the like.

An aim of the invention is to provide a machine or apparatus of the character described, which is simple in construction and effective in operation.

A further object of the invention is to provide an improved machine by means of which surfaces may be very quickly, economically and accurately lapped or finished.

Other objects will be in part obvious and in part pointed out more in detail hereinafter.

The invention accordingly consists in the features of construction, combination of elements and arrangement of parts which will be exemplified in the construction hereinafter set forth and the scope of the application of which will be indicated in the appended claims.

In the accompanying drawings wherein I have shown for illustrative purposes, one embodiment which the present invention may take;

Figure 1 is a top plan view with parts in horizontal section;

Fig. 2 is a sectional view taken substantially on line 2—2 of Fig. 1, the cover or plate 21 being omitted;

Fig. 3 is a view taken substantially on line 3—3 of Fig. 1 and illustrates, in end elevation, the bracket 38 together with the parts carried thereby;

Fig. 4 is an elevational view of the slide 23; and

Fig. 5 is a sectional view taken substantially on line 5—5 of Fig. 1.

Referring to the drawings in detail, 10 designates a base which may be of any suitable construction, the base being illustrated more or less conventionally in the drawings. This base has at one end a bearing 11 in which is journalled the shaft 12 of a crank 13. The shaft may carry a pulley 14 and the crank may have a radial T-slot 15. At the other end of the base is a standard or post 16 carrying a horizontally disposed tubular bearing 17 provided at its rear end with oppositely extending arms 18. The base 10 has between its ends a standard 19 provided with a circular casing 20 having a cover 21. Supported by the arms 18 and the standard 19 are a pair of parallel guide rods 22 on which is slidably mounted a slide 23 of the shape shown in Figs. 1 and 4. The numeral 24 designates a connecting rod or yoke the arms of which straddle the casing 20 and the slide 23. The ends of these arms are pivotally or hingedly connected to the slide by means of screws or bolts 25. The rear end of the yoke is connected with the crank 13 by means of a bolt 26. This bolt has a T-head adjustably mounted in the T-groove 15 so as to vary the throw of the yoke and the slide fixed thereto when the crank is rotated.

The numeral 35 designates what for convenience is termed a tool carrier which in the present instance is in the form of a tube or sleeve, the forward end of which is slidably and rotatably mounted in the support or bearing 17. The tool carrier extends through an opening 36 in the slide 23 and has at its rear end a ratchet wheel 37. The rear end of the carrier is journalled in a bracket 38 which has a sliding fit on one of the guide rods 22. In order that the carrier 35 and the bracket 38 will move longitudinally in unison, the bracket is located between the wheel 37 and nuts 39 screwed onto the threaded portion 40 of the carrier. The ratchet wheel 37 co-operates with a pawl 41 pivoted on a stud 42 carried by the bracket 38. The pawl is normally urged into engagement with the ratchet by a spring 43. The member 23 has limited sliding movement on the threaded portion 40 of the carrier. For the purpose of adjusting the extent of such sliding movement, there are provided on the carrier and on opposite sides of the slide adjustable abutments which are here in the form of nuts 44 and 45 respectively.

Journalled in the casing 20 and extending into the rear end of the carrier 35 is a stem 50 which is so associated with the carrier that when either of the elements is moved longitudinally, the other is given a partial

revolution. To this end, one of the elements is provided with a spiral groove and the other with a key adapted to engage in the groove. In the illustrated disclosure of the drawings, the stem 50 is provided with a pair of spiral grooves 51 and the carrier is provided with a pair of pins or keys 52 engaging in the grooves. The end of the stem within the casing 20 is provided with a ratchet wheel 53, the teeth of which extend in the same direction as those of the ratchet wheel 37. Co-operating with the ratchet wheel 53 are one or more pawls 54, two of such pawls being shown in the present instance, these pawls being so rotated and proportioned that when one of them is operatively engaging a tooth the other is midway between two teeth. The pawls 54 are urged into engagement with the ratchet wheel 53 by springs 55. The end of the stem may have a stud 56 journalled in the cover 21.

The forward end of the tool carrier or sleeve 35 has a square axial opening 60 through which extends the square shank 61 of the tool holder. The forward end 62 of this holder is preferably threaded and is of a diameter to slide in the bearing 17. The tool holder will rotate with the carrier 35 due to the polygonal shape of the shank 61 and the opening 60.

In some instances it may be found desirable to move the tool holder together with the tool carried thereby longitudinally by hand. This may be done by disconnecting the shank 61 from the tool carrier and turning the threaded nut or hand wheel 65 screwed on the forward protruding threaded end of the tool holder and engaging against the forward end of the bearing 17. For the purpose of detachably connecting the tool holder to the carrier the shank of the tool holder may be provided with longitudinally spaced-apart notches 66 and the tool carrier may be provided with pins 67 adapted to be engaged in and disengaged from these notches. The pins extend through circumferential slots 68 in the carrier and are carried by a ring 69 encircling the carrier and having limited rotary movement relative thereto.

As previously stated, while my improved machine finds peculiar application in the operation of lapping cylindrical surfaces, such as the cylindrical chambers of air valves and the like, it is adapted to operate on surfaces of various kinds. In the present instance I have shown the work as comprising an air valve body. This disclosure is by way of illustration only. The work is designated generally by the letter W. The tool which is shown for illustrative purposes only, is disclosed as having a tapered shank 70 carrying a cylindrical lapping member 71 and an extension 72.

The operation of the device is briefly as follows. It may be found of advantage to manually feed the tool into the work, particularly if the tool has a close fit therein. This may be done by turning the ring 69 to the position shown in Fig. 5, that is, to a position where the pins 67 are disengaged from the notches 66. The hand wheel 65 may then be turned so as to longitudinally move the tool holder together with the tool, and at the same time the tool may be rotated step by step by the machine. After the tool has been properly fitted into the work, the tool holder may be engaged with the tool carrier by turning the ring 69 to a position where the pins 67 engage in the notches 66, and thereupon the tool holder will reciprocate with the tool carrier. Assuming that the slide 23 is moving to the left, referring to Fig. 1, this slide will move without affecting the tool carrier until the slide comes into engagement with the nuts 44 whereupon the carrier will be moved longitudinally to the left. Upon such movement of the carrier, it will be rotated a part of a revolution, in the present instance one quarter of a revolution, in a clockwise direction, referring to Fig. 2. Such rotation is due to the operation of the keys 52 in the slots 51 of the stem, the stem being held against rotation in a counter-clockwise direction by the pawls 54. Thus the carrier together with the tool carried thereby, is given a spiral movement at the end of one stroke of the slide 23. Upon continued rotation of the crank the slide will move to the right and when it has been brought up against the nuts 45, it will advance the carrier together with the tool carried thereby. Upon such movement of the carrier it will not rotate, but the stem 50 will rotate a partial revolution in a clockwise direction. This is due to the fact that the pawl 41 prevents the carrier from rotating counter-clockwise while the stem is free to be rotated clockwise by the keys 52 operating in the grooves 51. The slide having been advanced to the extreme end of its forward stroke, will now slide back and again engage the nuts 44 to withdraw the tool and cause it at the same time to take another rotary step in a clockwise direction. The slide is repeatedly reciprocated until the lapping or other operation is completed. It will thus be seen that the tool carrier together with the tool carried thereby is longitudinally reciprocated and upon the movement of the tool in one direction it does not rotate and upon the movement of the tool in the opposite direction it does rotate. Rotation of the carrier and tool is effected in a series of steps, each step in the present instance being about a quarter of a turn. This all means that the tool on each movement thereof will move in a different path, thus preventing scoring or grooving of the work. The tool holder may be adjusted longitudinally of the tool carrier by selectively engaging the pins 67 in

the proper notches 66 depending on the length of the tool, the kind of work or other factors. The extent of reciprocating movement and the extent of rotary movement of the tool carrier may be varied at will by adjusting the abutments or nuts 44 and 45. The closer these nuts are adjusted together the greater will be the extent of reciprocation and the extent of rotary movement of the tool carrier.

As many changes could be made in the above construction and many apparently widely different embodiments of this inventino 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 drawing shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the language used in the following claims is intended to cover all of the generic and specific features of the invention herein described and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

I claim as my invention:

1. In a machine of the character described, a tool carrier mounted for reciprocating and rotary movements, means for reciprocating said carrier, and mechanism for imparting a partial revolution to said carrier upon each stroke thereof in one direction, said mechanism including a rotary element, means for preventing rotation of said element in one direction, means for preventing rotation of said carrier in the same direction, and means between said carrier and element whereby, when said carrier is moved in one direction, one of said elements is rotated and when the carrier is moved in the other direction the other of said elements is rotated.

2. In a machine of the character described, a sleeve-like tool carrier mounted for reciprocating and rotary movements, a slide through which said tool carrier extends, means for reciprocating said slide, means for adjustably limiting the extent of movement of said slide relative to said carrier, a stem engaging in said carrier and mounted for rotary and fixed against longitudinal movement, a spiral groove in said stem, a pin carried by said carrier and engaging in said groove, a ratchet wheel carried by said carrier, a pawl cooperating with said wheel for preventing rotation of said carrier in one direction, a ratchet wheel carried by said stem, and a pawl cooperating with said last mentioned ratchet wheel for preventing rotation thereof in the same direction.

3. In a machine of the character described, a tool carrier mounted for reciprocating and rotary movements, means for reciprocating said carrier, a tool holder rotatable with and longitudinally adjustable relative to said carrier, means for detachably connecting said tool holder in any one of a number of predetermined longitudinal positions of adjustment, and means for imparting a partial revolution to said carrier and holder upon each stroke thereof in one direction.

4. In a machine of the character described, a tool carrier mounted for reciprocating and rotary movements and having a polygonal opening, means for reciprocating said carrier, means for imparting a partial revolution to said carrier upon each stroke thereof in one direction, means for holding said carrier against rotation on each stroke thereof in the other direction, a tool holder having a shank slidably fitting in said opening and a threaded portion, means for connecting said shank to said carrier whereby the same reciprocate in unison, and a nut on said threaded portion for manually moving said tool holder longitudinally.

5. In a machine of the character described, a fixed bearing, a sleeve-like tool carrier having a rotary and sliding fit in said bearing, fixed guide rods on opposite sides of said carrier, a slide supported by said guide rods, a yoke connected to said slide and through which said slide is reciprocated on said rods, nuts on said carrier for adjusting the extent of movement of said slide relative to said carrier, a stem engaging in said carrier and having a spiral groove, a key on said carrier and engaging in said groove, means for rotatably supporting said stem against axial movement, a ratchet wheel on said stem, a pawl cooperating with said wheel, a bracket slidable on one of said rods, said carrier being rotatable in and fixed against longitudinal movement relative to said bracket, a ratchet wheel on said carrier, and a pawl carried by said bracket and cooperating with said wheel.

6. In a machine for lapping and the like, a tool carrier, means for supporting the tool carrier for reciprocating and rotary movements, and means for simultaneously reciprocating and intermittently rotating said tool carrier.

7. In a machine for lapping and the like, a tool carrier, means for supporting the tool carrier for reciprocating and rotary movements, means for reciprocating the tool carrier, and rotating means connected to the reciprocating means for intermittently turning the tool carrier upon each stroke of the reciprocating means in one direction.

8. In a machine for lapping and the like, a tool carrier, means for supporting the tool carrier for reciprocating and rotary movements, means for reciprocating the tool carrier, and rotating means for the tool carrier connected to the reciprocating means for intermittent actuation thereby to rotate the tool carrier.

9. In a machine for lapping and the like,

a tool holder, means for supporting the tool holder for reciprocating and rotary movements, means for reciprocating the tool carrier, means for intermittently rotating the tool carrier connected to the reciprocating means for rotating the carrier upon the stroke of the reciprocating means in one direction, and means for holding the tool carrier from rotation in a reverse direction during the return stroke of the reciprocating means.

GEORGE W. ANDREWS, JR.