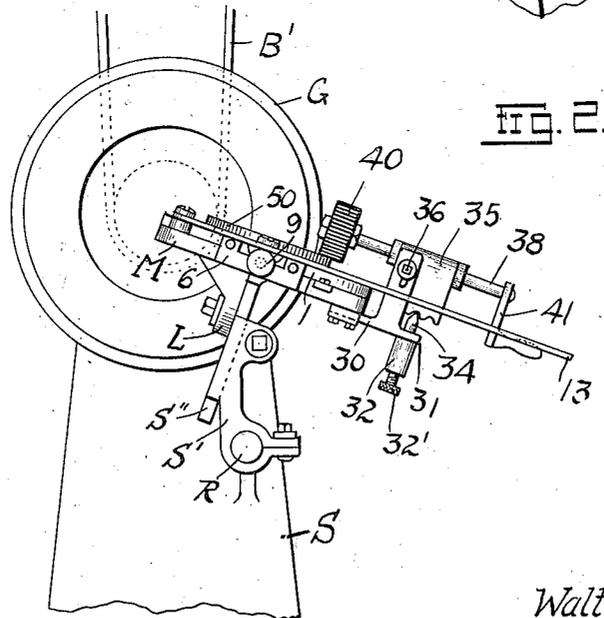
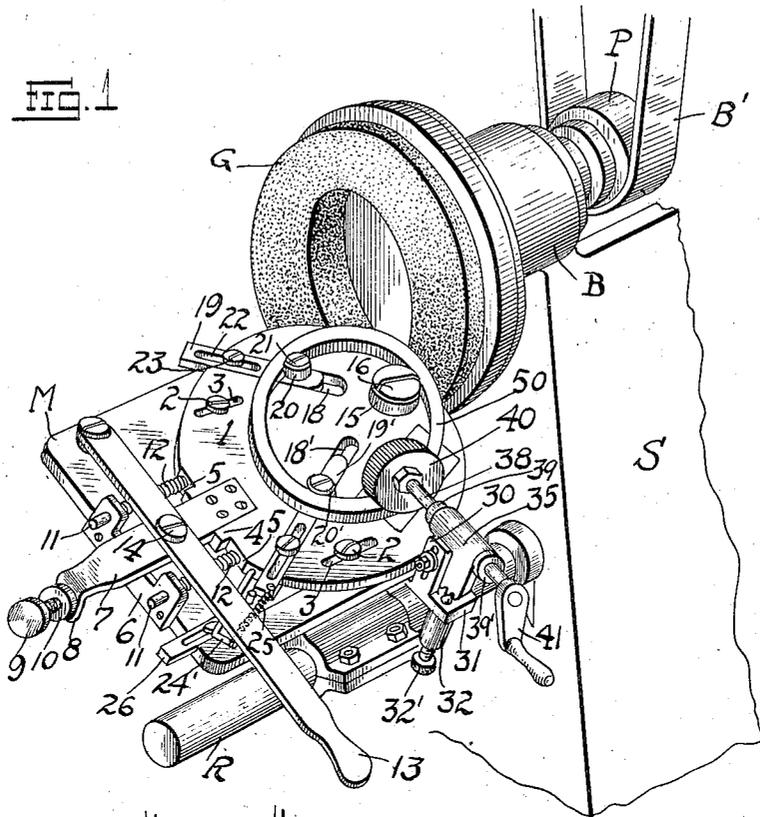


Jan. 2, 1923.

1,440,639

W. J. SMITH.
GRINDING MACHINE.
FILED JUNE 8, 1921.

3 SHEETS-SHEET 1



Inventor.
Walter J. Smith.

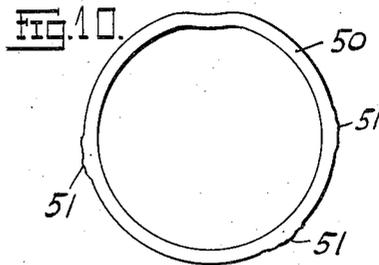
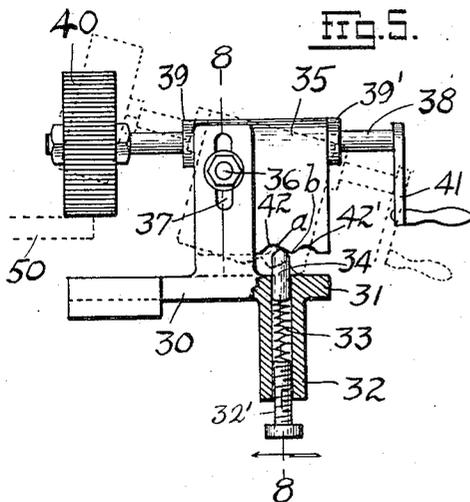
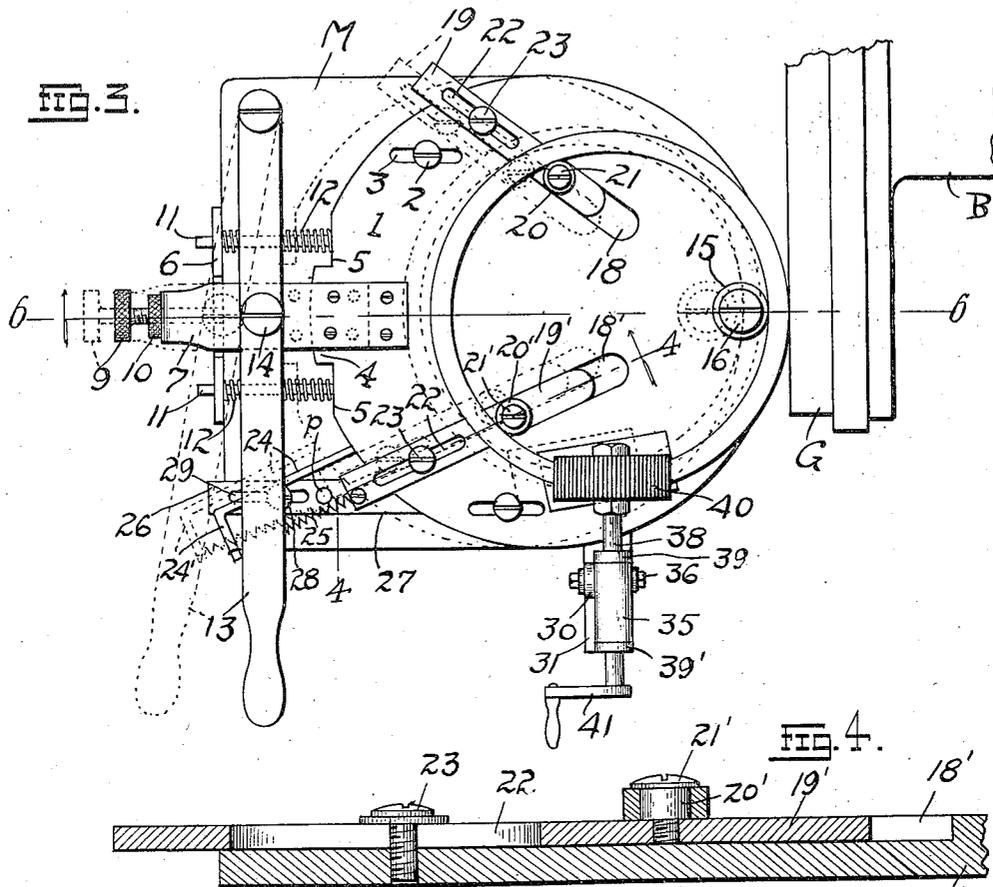
By Harry A. Beunes
Atty.

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3 SHEETS-SHEET 2



Inventor:
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UNITED STATES PATENT OFFICE.

WALTER J SMITH, OF ST. LOUIS, MISSOURI, ASSIGNOR TO McQUAY-NORRIS MFG. CO.
OF ST. LOUIS, MISSOURI, A CORPORATION OF MISSOURI.

GRINDING MACHINE.

Application filed June 8, 1921. Serial No. 476,026.

To all whom it may concern:

Be it known that I, WALTER J. SMITH, a citizen of the United States, residing at St. Louis, State of Missouri, have invented certain new and useful Improvements in Grinding Machines, of which the following is a specification.

My invention has relation to improvements in grinding machines, and is especially adapted to grinding the outer surface of piston rings in order to remove the unevenness due to casting, although I do not wish to be understood as restricting the application of the invention to piston rings, as it may be employed with equal advantage to any article of manufacture wherein a given surface is subjected to a grinding operation to make said surface conform in contour with an opposite surface in order to produce an article of uniform thickness.

It is well understood in the art that when an article in the shape of a ring, such as a piston ring, is cast, it often happens that the pressure of the metal against the outer wall of the mould distends the mould in places due to the fact that the sand, not being sufficiently compacted, gives way to a certain extent on the outside. The sand on the inside of the mould is more compact, having been confined by the inner wall of the pattern, and successfully resists the pressure of the molten metal, resulting in a casting that is perfectly true along its inner wall or surface. The fact that the inner surface of the ring is true is availed of by my invention to make the outer surface also true, the same being made to conform in contour with the inner surface, thus producing a ring of absolutely uniform thickness.

Heretofore, as far as I am aware, the rings that were imperfect as above set forth were rejected, but by my invention these rings are made useful by grinding the outer surface true.

The advantages of the invention will be better apparent from a detailed description of the same in connection with the accompanying drawings in which—

Figure 1 is a perspective view of my improved grinding machine; Fig. 2 is an end elevation thereof; Fig. 3 is a top plan view of the same; Fig. 4 is an enlarged sectional detail taken on the line 4—4 of Fig. 3; Fig. 5 is a side elevation of the feed mechanism for rotating the ring past the grinding

wheel; Fig. 6 is a vertical cross-section taken on the line 6—6 of Fig. 3, parts being left in elevation; Fig. 7 is a fragmentary perspective view of the spring controlled slide and abutment post whereby the slide is released when the work-table is pulled back for removing the ground ring; Fig. 8 is a vertical section taken on the zig-zag line 8—8 of Fig. 5; Fig. 9 is an enlarged sectional detail of the ball bearing abutment roller; and Fig. 10 is a face view of a piston ring to be ground showing greatly exaggerated the irregular outer periphery of the ring.

Referring to the drawings S represents a standard, G a grinding wheel mounted in the bearing B, and P a drive pulley driven by belt B' from a suitable source of power. A supporting rod R projects from the side of the standard S and a bracket S' is adjustably clamped onto the rod R, said bracket being provided with an adjustable slide S'' to which is bolted a lug L carrying a suitable base-plate M. The parts thus far described are well known in the art constituting the elements of an ordinary grinding machine, and are availed of by me in the application of my improvement about to be described.

A substantially circular work-table 1 is supported on the base-plate M in close proximity to the grinding wheel G and held in position on the base-plate by guide-studs 2, 2 operating through slots 3, 3 and screwed into the base-plate. The periphery of the work-table opposite the grinding wheel has a tongue 4 formed on it, and on either side thereof are plane surfaces 5, 5. A U-shaped plate 6 is secured to the edge of the base M opposite the tongue 4, and an arm 7 is secured to the work-table over the tongue 4, said arm being recessed in the work-table and having a downwardly bent finger 8 formed on its free end through which is screw-threaded an adjusting screw 9, the inner end of the screw bearing against the plate 6. A lock-nut 10 is passed over the screw 9 to maintain the same in the adjusted position. Projecting from the plane surfaces 5, 5 of the work-table are studs 11, 11 on which are coiled springs 12, 12, the studs traversing the U-plate 6 and the springs being confined between the edge of the work-table and plate 6 so as to urge the work-table toward the grinding wheel and main-

tain the screw 9 in abutting relation with the plate 6. A lever 13 is pivotally mounted on the base M adjacent the rear edge thereof and is screwed to the arm 7 at an intermediate point 14 and projects forwardly a sufficient distance so that it may be conveniently oscillated by the operator for a purpose presently to appear.

The work-table 1 is provided with a ball bearing 15 contiguous to the grinding wheel G, the ball bearing being mounted on a stud 16 a short distance inwardly from the periphery of the work-table so that a passage-way 17 is formed between the ball bearing 15 and the grinding surface of the wheel G. By turning the adjusting screw 9 the work-table may be moved toward or away from the grinding wheel so as to adjust the passage-way 17 to conform to the required thickness of the ring to be ground, as will be seen in the description of the operation of my invention. The work-table 1 has grooves 18 and 18' formed in its top face, said grooves being substantially one hundred and twenty degrees apart at the periphery of the table and converging toward the ball bearing 15 but terminating short of said bearing, however, and positioned in the grooves 18, 18' are slides 19, 19' respectively, said slides carrying near their inner ends rollers 20, 20' mounted on studs 21, 21' respectively. Each of the slides has a slot 22 formed in it near its outer end which is traversed by a stud 23 secured into the table 1. The stud 23 in the slide 19 is used as a clamping screw to securely hold said slide in its adjusted position, while the stud 23 in the slide 19' is used merely as a confining element to hold it in its slot 22 while permitting the slide to reciprocate. A finger 24 projects outwardly from the edge of the table 1 and has its extremity 24' bent over so as to come substantially in line with the slide 19' and a coiled spring 25 is secured at one end to the slide 19' and at the other end to the bent finger 24', said spring exerting an outward pull on the slide 19'. A slide 26 is mounted in a slot 27 in the base M near the front edge of the base, said slide being adjustably secured in the base by a stud 28 traversing a slot 29 in the slide and secured in the base. The slide 26 carries a stop-pin *p* projecting from its upper surface, said stop-pin being in line with the slide 19' and spaced a short distance from the outer end thereof.

A bracket 30 is secured at the front of the base M and is provided with a forwardly projecting flange 31 which has a cylindrical socket 32 depending from it, the lower part of said socket being screw-threaded to receive an adjusting screw 32' for regulating the tension of a spring 33 contained in the socket between the screw and a round-nosed tumbler 34. A block 35 is pivotally mount-

ed on a bolt 36 adjustably secured in a slot 37 in the bracket 30, the upper part of the block being bored to provide a bearing for spindle 38 maintained in the block by collars 39, 39' on the spindle, said spindle carrying 70 on its inner end a feed-roller 40 milled on its periphery and having a crank 41 on its outer end whereby the roller may be rotated. The block 35 has a pair of continuous grooves 42, 42' formed on its under side above 75 the tumbler 34, said grooves being so spaced that when the block is in a horizontal position (Fig. 5) the tumbler 34 will bear against the inclined wall *a* of groove 42 and urge the roller downwardly, and when the crank-handle 80 is pressed downwardly the wall *a* will cam the tumbler into the socket until it passes the ridge *b* at which moment the spring 33 will urge the tumbler upwardly into the groove 42', the block being maintained in an inclined position with the roller raised (dotted position Fig. 5).

The operation of my invention may be described as follows:

We will assume that a ring 50 is imperfectly cast having irregular swells 51, 51 at points in its periphery due to the giving way of the sand when the metal is poured as above described. Now this ring would ordinarily be rejected as it is worthless as 95 a piston ring unless the outer periphery can be ground to correspond in contour with the inner periphery to produce a ring of even thickness all around, so essential to give to the finished ring uniform tension 100 against the cylinder walls at all points. In accomplishing this object in my machine I avail myself of this true inner periphery of the ring by causing the outer periphery of the ring to pass over a grinding surface 105 while the inner periphery is maintained in contact with a fixed abutment spaced from the grinding surface a distance corresponding to the thickness of the finished ring. The operator first adjusts the width of the 110 space 17 to correspond with the thickness of the rings he is working on. This, as has been explained, is done by turning the screw 9 in the proper direction. Then the slides 19, 19' are set so that when the ring 115 is placed on the work-table in engagement with ball bearing roller 15, the rollers 20, 20' will bear against the inner surface of the ring, the roller 20' exerting pressure against the ring under influence of spring 120 25. The operator now turns the crank 41, whereupon the feed roller 40, bearing against the side face of the ring under influence of spring 33, will rotate the ring on the work-table, said crank being turned 125 until the ring has been rotated one complete turn. By this time the entire outer periphery of the ring has passed over the rapidly revolving grinding wheel and all the irregularities have been ground off so 130

that the thickness of the ring at all points in its circumference is the same. The operator now bears down on the crank 41, raising the wheel 40 off the ring, and throws the lever 13 to the left, pulling the work-table away from the grinding wheel over the tension of springs 12, 12. As the work-table moves outwardly the outer end of slide 19' will engage the pin *p* which arrests the slide, the work-table continuing in its movement a short distance further. The roller 20' is, of course, arrested with the slide 19' and the ring 50 continues on a short distance with the work-table thus effecting a separation of the ring and roller 20' so that the ring may be removed from the work-table and another placed thereon, when the operation is repeated. When the slides 19, 19' and work-table 1 have been once adjusted for a given size of ring they do not again have to be adjusted unless a different sized ring is ground.

It will be observed that the base M is shown inclined in the drawings, the ring being ground on the bias, which results in a better grinding action than if the rings were ground parallel with their axes, although they may be ground straight across the periphery with good results.

The invention is susceptible to many modifications, in the hands of a skilled mechanic, that would fall within the spirit of the same and I do not wish to be restricted to the precise details of construction herein shown.

Having described my invention, I claim:

1. In a machine for grinding piston rings, a grinding element, a work-table adjacent thereto, a ball bearing abutment member on the work-table against which the inner periphery of the ring is adapted to bear, rollers slidably mounted on the work-table for holding the ring in engagement with the abutment member, means for maintaining the abutment member a predetermined distance from the grinding element, means for rotating the ring past the abutment member, and means for releasing the ring from the rollers.

2. In a machine of the character described, a grinding element, a work-table

adjacent thereto, an abutment member fixed on the work-table, means for adjusting the abutment member to and from the grinding element, a pair of work-holding members adapted to maintain the work in engagement with the abutment member, and means for feeding the work past the grinding element.

3. In a machine of the character described, a grinding element, a work-table adjacent thereto, an abutment member fixed on the work-table, means for adjusting the abutment member to and from the grinding element, a pair of work-holding members adapted to maintain the work in engagement with the abutment member, means for releasing one of said work-holding members from the work, and means for feeding the work past the grinding element.

4. In a machine of the character described, a grinding element, a work-table adjacent thereto, an abutment member fixed on the work-table, means for adjusting the abutment member to and from the grinding element, a pair of work-holding members adapted to maintain the work in engagement with the abutment member, means for withdrawing the work-table from the grinding element for disengaging the work, and means for feeding the work past the grinding element.

5. In a grinding machine, a grinding element, a work-table adjacent thereto, an abutment member on the work-table, a pair of work-holding members adapted to maintain the work in engagement with the abutment member, and means for feeding the work past the grinding element.

6. In a grinding machine, a grinding element, a work-table adjacent thereto, an abutment member on the work-table, a pair of work-holding members adapted to maintain the work in engagement with the abutment member, means for adjusting said work-holding members to the work, and means for feeding the work past the grinding element.

In testimony whereof I hereunto affix my signature.

WALTER J. SMITH.