To all whom it may concern:

Be it known that I, RALPH D. GARDNER, of Beloit, Wisconsin, have invented certain new and useful Improvements in Ring-Grinding Machines, of which the following is a specification.

This invention relates in general to grinding machines, and has more particular reference to a machine for grinding the sides or faces of piston rings to bring the rings to a uniform predetermined thickness, and to impart a finish to these faces.

I am aware that it has heretofore been customary to grind and finish the faces of piston rings by machines that were adapted to grind the rings one at a time, by means of opposed grinding tools or discs which were rotated in the same direction, the rings being successively positioned between the discs at one side thereof, and after the grinding operation was performed, they were removed from the discs at the same side of the machine.

One of the primary purposes of my present invention is to provide a machine for the general purpose indicated, which will be capable of grinding and finishing a plurality of rings simultaneously, and in which the rings are fed to the grinding tools from one side thereof and are delivered from the tools at the opposite side.

Another feature of my invention resides in the fact that the opposed grinding tools, are rotated in opposite directions, thereby obviating the tendency to crush the rings during the grinding operation, and also neutralizing the grinding effect on both the front and back sides of the grinding tools.

Another object of the invention is to provide a machine in which the rings will be automatically delivered from the hopper into position to be operated upon by the grinding tools, and thereafter automatically discharged from between the tools.

Further objects are to provide a machine which will be simple in construction, accurate and efficient in operation, one which will be durable, and which can be operated with great rapidity, so as to turn out a maximum number of finished rings, and one which will require but little attention and can be operated by unskilled labor.

Further objects and many of the attendant advantages of my invention will be readily appreciated, as the same becomes better understood by reference to the following description when considered in connection with the accompanying drawings.

Referring to the drawings:

Fig. 1 is a side elevation of a grinding machine embodying my invention; and

Fig. 2 is an end elevation thereof looking toward the left at Fig. 1.

By reference to the drawings, it will be observed that the machine comprises essentially, a frame or base portion 3, upon which the various operating mechanisms are mounted, as will be later explained. The upper face of the frame at each side of the center thereof is shaped to provide a guide-way 4, and upon each of these guideways, there is adapted to reciprocate a carriage 5 provided with suitable bearings in which the tool carrying shafts 6 are journaled, these shafts being equipped at their inner ends with grinding tools in the shape of abrasive discs 7 disposed in opposed relation to each other. The shafts may be rotated to impart suitable rotary movement to the grinding tools by any preferred mechanism, but in the present instance, I have shown each shaft as directly connected with an electric motor 8, the motors being so wound that they rotate at substantially the same speed, but in opposite directions so that the opposed grinding tools are rotated in opposite directions instead of in the same direction as has heretofore been customary.

The carriages 5 with the grinding tools mounted thereon, are moved toward and from each other by suitable mechanism operated from a rock shaft 9, which in turn is actuated by a lever arm 11 fixed thereto. Since the connecting mechanism between the shaft 9 and the respective carriages may be of any preferred construction, it is not illustrated herein, but one practical and preferred mechanism for accomplishing this result is disclosed in co-pending application, Serial No. 426,357 filed November 26, 1920.

A weight 12, attached to the outer end of the lever arm 11, tends to rock the shaft 9 in a clockwise direction to move the grinding tools 7 toward each other into grinding relation with a ring or rings interposed between the tools. The lever arm is lifted to rock the shaft 9 into counter-clockwise direction for the purpose of moving the tools apart to permit the discharge of the finished
rings and the insertion of new rings therebetween, by means of a cam 13 mounted upon a countershaft 14, and engaging a follower 15 carried by the arm 11. This shaft is driven by a train of gearing from a drive shaft 16, equipped with a belt pulley 17, to which power is transmitted by a belt from any suitable source.

The rings to be operated upon are fed into position between the grinding tools by mechanism which operates in predetermined timed relation with respect to the approaching and separating movements of the grinding tools 7. The rings designated by reference character 18 are placed in a magazine 19, carried by a standard or upward-extending bracket 21, and are adapted to drop by gravity from this magazine into a guideway or horizontally extending chute 22 the bottom of which is formed by a plate or bar 23 extending transversely across the grinding tools 7, this bar being rigidly secured in position by attachment at one end to the standard 21, and at its opposite end to an upright standard 24, as shown in Fig. 2. The magazine 19 is shown in the present instance as being adapted to deliver two rings simultaneously to the chute, but it may be proportioned to deliver only one ring at a time, or if desired, more than two may be delivered, the number of rings which are delivered from the magazine and fed to the grinding tools at one time being determined by the proportions of the magazine, and the length of movement of the feeding mechanism by which the rings are fed into position between the tools.

For the purpose of feeding the rings from directly beneath the magazine into position between the grinding tools, I employ a reciprocatory plunger or pusher 25, which is equipped with a laterally projecting pin 26 extending outwardly through an elongated slot 27 in the plate 28, this pin being connected at its outer end through a slot 29 with the long arm 31 of a bell crank lever fulcrumed upon the frame of the machine at 32. The short arm 33 of this lever carries at its end a weight 34, which normally tends to rock the lever in a clockwise direction upon its fulcrum so as to project the plunger 25 toward the right, viewing Fig. 2 whereby to simultaneously deliver the two lowermost rings beneath the magazine 19 into operative position between the grinding tools 7. The lever is swung in the opposite direction to retract the buffer 25 by means of a cam 35 mounted upon the shaft 14 in position to engage a roller or follower 36 mounted upon the long arm 31 of the bell crank lever, as shown.

For the purpose of holding the rings in position between the grinding tools and to prevent them from accidentally escaping therefrom, the top of the chute between the tools is formed by a bar 37 mounted at its ends in guides 38 and 39 respectively. Approximately centrally of the tools 7, this bar is provided on its lower edge with a downwardly projecting shoulder 41, and a similar shoulder 42 is formed on the bar adjacent to the perimeter of the tools at the delivery side thereof. The bar is yieldingly depressed into engagement with the perimeters of the rings disposed in the chute by means of springs 43 and 44, which springs, however, are adapted to yield so as to permit an upward movement of the bar 37 when the rings are forced to the right between the tools by the plunger 26, thereby permitting the feeding of the rings, but preventing accidental displacement of the rings and holding them in grinding position between the tools.

In the operation of my machine, assuming that the grinding tools are in retracted position, the plunger 25 is operated by the mechanism previously described to introduce two rings from beneath the magazine into position between the grinding tools at the left of the vertical center thereof, viewing Fig. 2, whereupon the tools are caused to approach into grinding relation with the rings so as to simultaneously grind the opposite faces thereof. Since the tools rotate in opposite directions, there is no tendency for the rings to be carried around with the tools and the action upon the opposite faces of the rings is such that there is little danger of their being crushed or injured by the grinding operation. After a predetermined period of grinding, the tools are automatically retracted, whereupon the plunger 25 is again reciprocated, introducing two more rings into position between the tools, and at the same time forcing the two rings at the left side of the center, the escape of these two rings being precluded by the shoulder 44, while the shoulder 41 serves to prevent accidental movement of the rings at the left side of the center beyond the desired position. Upon the next approach of the tools, the two rings at the left receive their initial grinding while the two rings at the right receive their finishing grinding. Upon the next actuation of the plunger 25, the rings at the left are moved to the right, thereby displacing the finished rings, which are delivered from between the tools at the end of the chute into a receptacle or runway, by which they may be conveyed to any desired point, and two more rings are simultaneously delivered from the magazine into position to be operated upon.

It will be apparent from the foregoing that my improved machine is designed to operate upon and simultaneously finish a plu...
rality of rings, also that the machine is entirely automatic in its operation, it being only necessary for the operator to keep the magazine filled with rings, and furthermore, that the tools acting in opposite directions upon opposite faces of the rings tend to neutralize the crushing or destructive effects of each other and serve to impart to the rings, a uniform and desirable finish. Furthermore, since substantially the entire grinding face of each tool is utilized, the tools are worn down evenly and are capable of being used for a maximum length of time.

Obviously, also, a machine embodying my invention may be used for grinding and finishing many other objects besides piston rings.

It is believed that my invention, its mode of operation, and many of its inherent advantages will be understood and appreciated from the foregoing without further description, and that while I have shown and described a preferred embodiment of the invention, the structural details thereof are capable of wide modification and variation without departing from the essence of the invention as defined in the following claims.

I claim:

1. In a grinding machine, the combination of a pair of opposed grinding tools, a chute extending between said tools, and means for feeding objects along said chute by a step by step movement so that the objects are operated upon by the tools at one side of a vertical central plane extending therethrough and subsequently by the tools at the opposite side of said plane.

2. In a grinding machine, the combination of a pair of opposed grinding tools, a chute comprising a stationary bottom and a yieldingly movable top provided with downwardly projecting shoulders, a magazine, and means for intermittently feeding objects from said magazine along said chute between said tools.

3. In a grinding machine, the combination of a pair of opposed grinding tools, a chute extending transversely between said tools, one wall of said chute comprising a yieldingly mounted member provided with stop shoulders, and means for automatically feeding objects to be ground along said chute into position to be acted upon by said tools.

4. In a grinding machine, the combination of a pair of grinding tools, means for intermittently moving said tools toward and from each other, a chute extending transversely between said tools, a magazine, a pusher, means for actuating said pusher to intermittently feed objects from said magazine into position between said tools, and a yieldable shoulder for preventing accidental displacement of the objects from between said tools.

5. In a grinding machine, the combination of a pair of opposed rotatable grinding tools, a chute extending transversely between said tools and comprising a fixed bottom and a yieldable top, and means for feeding objects to be ground in a step by step movement through said chute across the faces of said tools.

6. In a grinding machine, the combination of a pair of opposed rotatable tools, means for moving said tools toward and from each other, a chute extending transversely across said tools between the opposed faces thereof, reciprocatory means for feeding objects to be ground into said chute, the introduction of an object at one end of the chute being adapted to discharge another object at the opposite end of the chute, and means projecting into the chute in the path of the objects therein to prevent accidental displacement of the objects from the chute during the grinding operation.

7. In a grinding machine, the combination of a pair of co-axially disposed grinding tools having their grinding faces arranged in opposed spaced relation, a work supporting bar extending transversely across and between the grinding faces of said tools, means for intermittently feeding the work to be ground by a step by step movement along said support, and means disposed in the path of movement of said work to prevent accidental displacement of the work from between said tools.

RALPH D. GARDNER.