

Z. LITTMAN.
GRINDING MACHINE.

APPLICATION FILED APR. 12, 1916. RENEWED MAY 7, 1920.

1,361,883.

Patented Dec. 14, 1920.

4 SHEETS—SHEET 1.

Fig. 1.

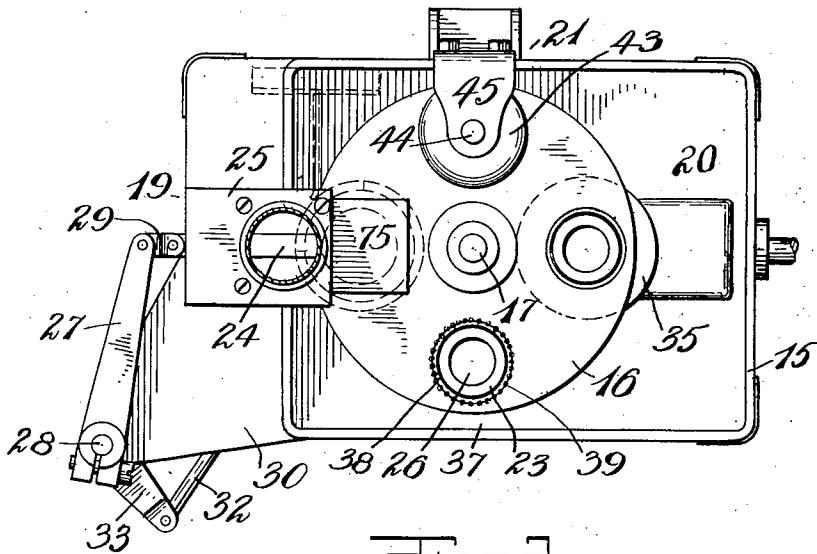
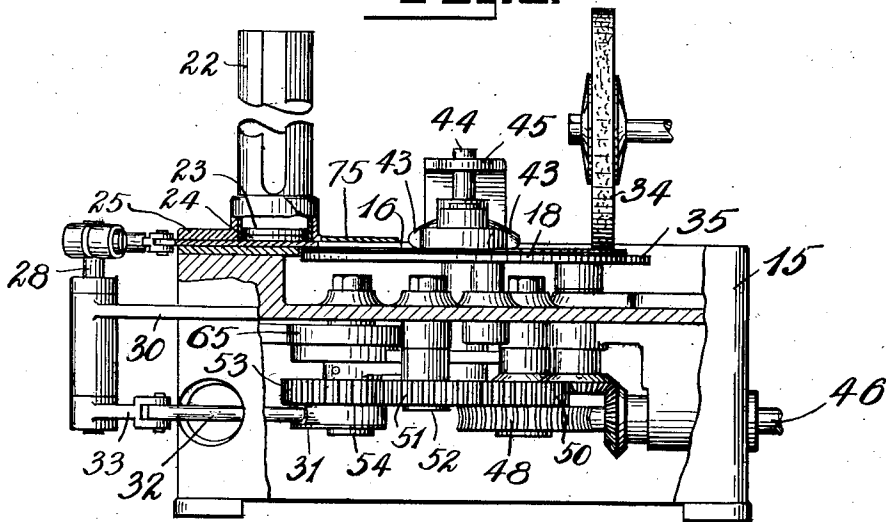


Fig. 2.



Zeno Littman Inventor
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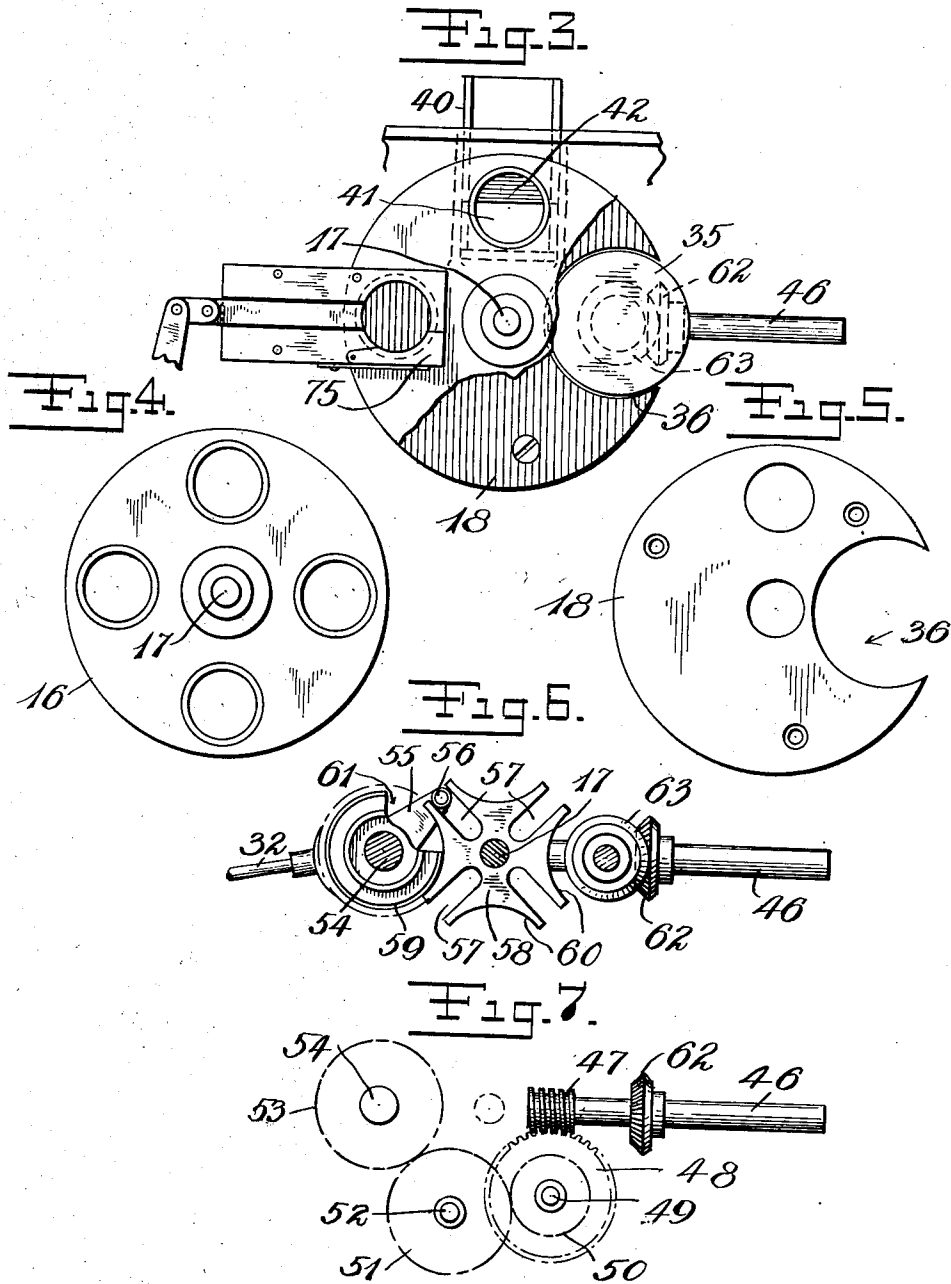
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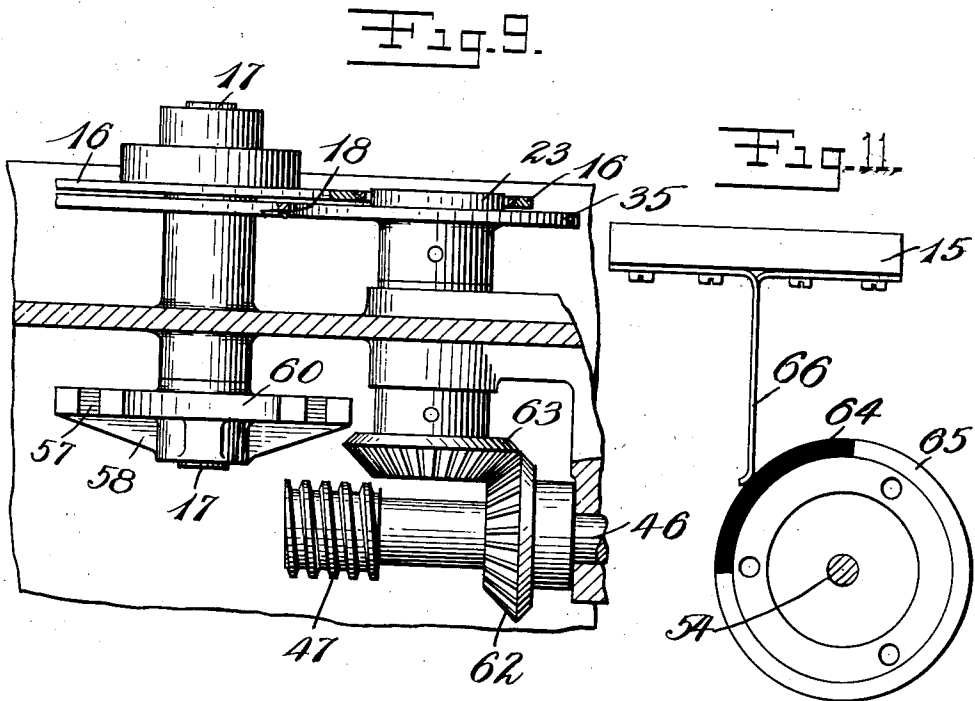
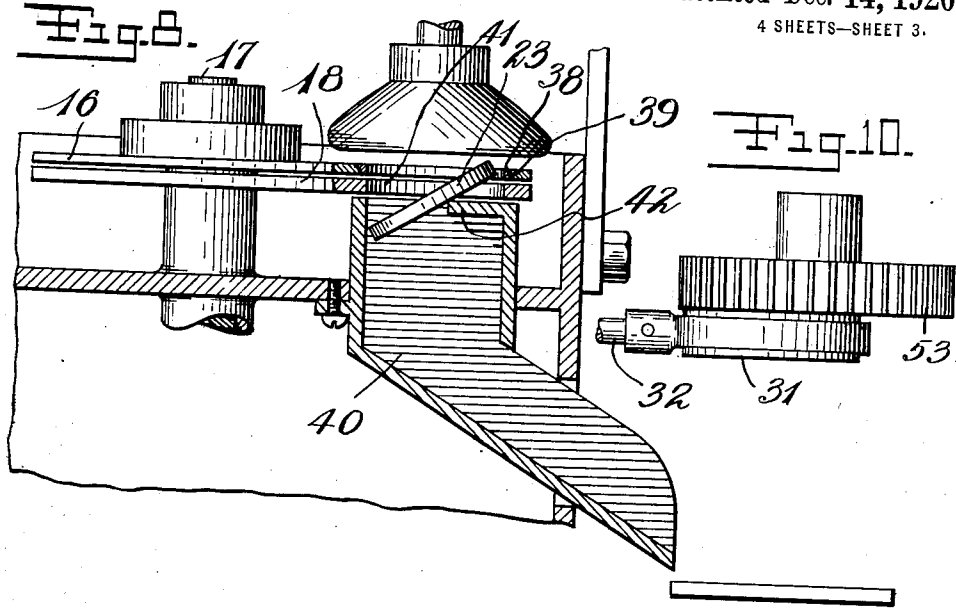
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4 SHEETS—SHEET 3.



Inventor
Zeno Littman
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Frank J. Kent

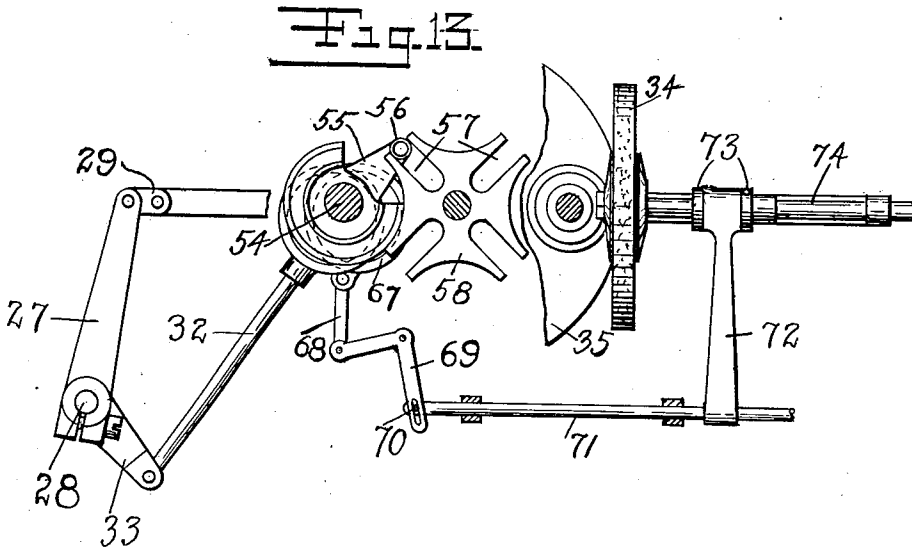
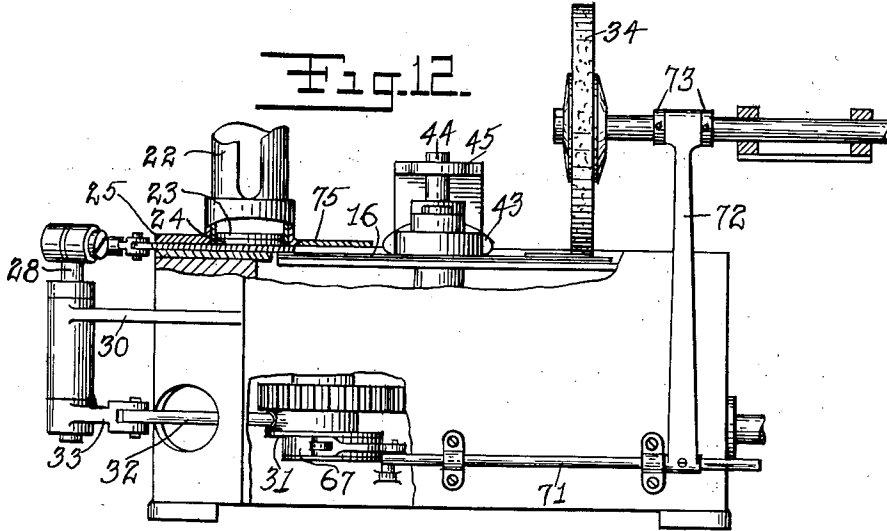
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4 SHEETS—SHEET 4.



Zeno Littman Inventor
By his Attorney
Frank J. Kent

UNITED STATES PATENT OFFICE.

ZENO LITTMAN, OF NEW YORK, N. Y., ASSIGNOR TO WASSON PISTON RING COMPANY, INC., OF NEW BRUNSWICK, NEW JERSEY, A CORPORATION OF NEW JERSEY.

GRINDING-MACHINE.

1,361,883.

Specification of Letters Patent.

Patented Dec. 14, 1920.

Application filed April 12, 1916, Serial No. 90,554. Renewed May 7, 1920. Serial No. 379,689.

To all whom it may concern:

Be it known that I, ZENO LITTMAN, a citizen of the United States, residing at No. 540 West 59th street, New York city, N. Y., have invented certain new and useful Improvements in Grinding-Machines, of which the following is a specification.

This invention relates to automatic apparatus for use in grinding the faces of piston rings, or other articles susceptible of similar treatment, and the object is to provide means whereby such articles may be ground expeditiously, with the aid of a simple, compact and reliable mechanism. To this end the invention comprises an intermittently movable carrier for the articles, preferably in the nature of a wheel having a plurality of open pockets to receive the articles, an underlying table for supporting the articles carried in these pockets, and means, preferably an electro-magnetic chuck, for revolving the articles in their pockets beneath a grinding element, and means for energizing and deenergizing the magnetic chuck and for bringing the grinding means into and out of action in time with the intermittent movements of the carrier. Means are also provided for charging the articles into the pockets at a charging station and for reversing and discharging the ground articles at another station. The invention also comprises various combinations and sub-combinations of these instrumentalities, as well as the preferred form of the elements as herein illustrated and described, it being understood, however, that form is not of the essence and that numerous changes may be devised, specifically different forms substituted and omissions made, without departing from the invention in its broader aspects.

Other features of the invention and details of construction will appear as the specification proceeds, attention being directed to the accompanying drawings forming part thereof and wherein I have illustrated a practical form the invention may take.

In these drawings, Figure 1 is a top plan view of this machine, the grinding wheel being omitted from this view for the sake of clearness and the supply hopper being shown in section; Fig. 2 is a side elevation and partial sectional view of this machine; Fig. 3 is a broken plan view, taken on a plane just above the carrier wheel and showing this wheel

broken away to more fully disclose the magnetic chuck below the same; Fig. 4 is a detached plan view of the carrier wheel; Fig. 5 is a similar view of the table which forms a bottom support for the blanks being transported by the carrier wheel; Fig. 6 is a detail plan view of the intermittent gearing by which the step-by-step motion is imparted to the carrier; Fig. 7 is a similar view illustrating the worm gear connection from the drive shaft and the train of gears between the several shafts of the machine, Fig. 8 is an enlarged fragmentary sectional view of the discharge mechanism; Fig. 9 is a similar view of the magnetic chuck and parts adjacent thereto; Fig. 10 is a detail view of the eccentric gear for operating the feed slide; and Fig. 11 is a detail view of the contact mechanism controlling the energization of the magnetic chuck; Fig. 12 is a view of the mechanism for operating the grinder in time with the feeding mechanism; and Fig. 13 is a detail of some of the parts shown in Fig. 12.

Considering the drawings now more in detail, 15 designates the base or bed of the machine, suitably constructed to support and maintain the several parts of the machine.

The carrier, in the machine illustrated, is in the form of a disk or wheel 16, mounted on a shaft 17 and rotating above a supporting table 18. Grouped about the carrier wheel are charging, grinding and discharging stations 19, 20 and 21, respectively.

The form of charging means selected for illustration consists of a hopper 22 in the form of a tube of a size to receive a stack of the articles, such as the ring elements 23, and a slide 24 operating in a guide 25 and adapted to strip off the bottom article and feed the same out onto the carrier wheel and into one of the pockets 26 provided in said wheel. This feeding slide is shown operated by an oscillating arm 27, mounted on the upper end of an upright shaft 28 and connected with said slide by a link 29, said shaft being mounted in a bracket 30, outstanding from the base and operated from an eccentric 31, by a rod 32 connected with an arm 33 on the lower end of said shaft. This particular type of charging means is not essential, and numerous other devices and arrangements for placing the articles in the pockets may be substituted therefor.

At the grinding station are located the

grinding means, which here takes the form of a grinding wheel 34 having its periphery presented to the articles, though this is not essential, and the article-holding and rotating member, which is preferably constituted by a rotating electro-magnetic chuck 35. The face of this chuck is disposed in the plane of the supporting table 18 and rotates within a recess 36 formed in the peripheral portion of the table, the article-holding pockets and the rotating chuck being concentrically disposed in the "rest" positions of the carrier wheel, as indicated in Fig. 1.

The article-holding pockets extend entirely through the carrier wheel, from which, in connection with the foregoing, it will be apparent that as this wheel rotates, the rings or similar articles inserted into these pockets at the charging station will be carried around, sliding over the top of the table, onto the rotating chuck; and this chuck, being energized at this time, will grip the articles and cause them to rotate therewith. The carrier wheel, in the illustration, is provided with four equidistantly spaced pockets and is given an intermittent movement, each movement being a quarter revolution, and the three stations are spaced apart distances corresponding to a quarter revolution.

To reduce friction of the articles in the pockets, particularly while the articles are being rotated by the chuck, the pockets may be lined by rings 38, rotating on ball bearings 39, and thus forming anti-friction rotatable holders for the articles.

The mechanism for discharging the articles, the faces of which have been ground, consists, in the machine shown, of a discharge chute 40 located beneath the table 18 at the discharge station and into which the articles fall through an opening 41 in the table.

Means are also provided in the illustration for turning the rings as they fall into this chute, in the form of a shelf 42 extending part way across the mouth of the chute as indicated best in Fig. 8, and adapted, by supporting only the one edge of the ring, to cause it to tilt and turn over as it falls down into the chute. This reversal of the rings brings them, as they leave this machine, into proper position to be transported by suitable means to another grinding apparatus, there to have their other faces ground.

A guard 43, in the nature of a cover, may be provided above the carrier wheel at the discharge station for confining the movement of the rings and insuring their dropping into the mouth of the chute, this guard also preventing entrance of foreign matter into the chute. This guard is preferably flat on the bottom with inclined or rounded edges to force downward any rings which may reach the discharging point in tilted positions, which might prevent them from

falling into the chute. The guard may be made adjustable by mounting it on a stem 44 adjustably engaged in a supporting bracket 45.

The several parts of the machine are driven in proper timing by suitable gearing, this gearing consisting in part, in the illustration, of a drive shaft 46, carrying a worm 47, meshing with a worm gear 48 on shaft 49, which carries a gear 50, meshing with gear 51 on shaft 52, gear 51 meshing also with a gear 53 on the eccentric or cam shaft 54.

The mechanism for imparting the intermittent movement to the carrier wheel is of the "Geneva" gear type, embodying an arm 55 on the cam shaft 54, carrying a roll 56 working in the slots 57 in the four-armed star wheel 58 on the carrier shaft 17 and a stop wheel 59 on the cam shaft against which the concave faces 60 of the star wheel bear three-quarters of the time and which is notched at 61 to receive the arms of the star wheel on the quarter turns thereof.

The rotating chuck is shown operated from the drive shaft through bevel gears 62 and 63. The chuck preferably is energized to grip the rings or other articles only at such times as the carrier has brought an article into position over the same, and is deenergized before the article is moved off the chuck by the next advancing movement of the carrier, this result being effected, in the machine shown, by means of an electric energizing circuit which is completed at the proper times by a commutator device illustrated in detail in Fig. 11, having an insulating section 64 and a contact segment 65 of proper extent and position, engaged by a brush 66. The contact brush may be supported on the frame of the machine, as indicated in dotted lines in Fig. 1, and the commutator may be mounted on the cam shaft 54 which then serves also as a timing means for the electric circuit.

Means are also provided for moving the grinding element, such as the disk 34, into and out of engagement with the rings in time with the operation of the drive for the carrier wheel 16, so that after a ring has been ground and immediately before the next intermittent movement of the carrier, the grinding disk is moved away from the ring, in order to permit the latter to be carried forward to the discharging point, the grinding disk being brought back into action again at the conclusion of this movement of the carrier wheel when the next ring has been centered upon the chuck. Such means may be widely varied, comprising, for example, a reciprocatory grinder shifting arm connected directly or indirectly by a properly proportioned train with the intermittent drive of the carrier wheel. In Figs. 12 and 13 a schematic con-

struction is shown for moving the grinder disk and its spindle endwise through connections with the eccentric shaft 54. In the said device this shaft is shown as being
 5 provided with a second eccentric 67, the strap of which is connected by a link 68 with a bell crank 69, the latter being in turn connected by a pin and slot 70 with a reciprocatory slide bar 71 carrying a shifter
 10 arm or fork 72, the opposite end of which acts upon shoulders 73 upon the grinder spindle 74. The spindle, it will be understood, is revolved continuously by suitable power means, not shown.

15 Manifestly other specifically different embodiments of means for moving the grinding disk back and forth in the desired relation to the periods of rest and movement of the carrier wheel may be devised. Thus,
 20 in cases where the invention is designed as an attachment for existing grinders containing mechanism for reciprocating the grinding disk, it is sufficient to connect and adjust the operating trains of the grinder and of
 25 the attachment in such manner that the two mechanisms operate in step.

The complete cycle of operations of this particular embodiment of the invention, briefly, is as follows: Upon each stroke of
 30 the feed slide 24, a ring is advanced out through the guideway 75 at the foot of the hopper, into one of the rotatable holders in the carrier wheel, this guideway preferably having a hinged side portion, as indicated at 76 in Fig. 3 to facilitate the feeding
 35 movement of the articles. A quarter turn is now imparted to the carrier wheel, bringing the ring therein to the first station 37 and which in the illustration is an idle station. On the next quarter turn the
 40 first blank is carried to the grinding station, at which time it slides off the table, on which it has been supported, onto the rotating chuck. At this time the chuck is de-energized and the grinder disk 34 is withdrawn away from the periphery of the ring.
 45 When the ring is centralized on the chuck, the chuck is energized, grips the article and rotates it, and at the same time the grinder disk is being moved gradually inward and then outward over and in contact with the
 50 upper face of the ring. This gives the upper exposed face of the blank the finish desired, and immediately before the commencement
 55 of the next quarter turn the grinder disk passes outward off the top of the ring and the chuck is deenergized, in order to permit the ring to be carried onward again over the table, to the discharge station, where it is
 60 turned over and sent out through the discharge chute. A fresh article is fed in at each quarter turn of the carrier wheel so that the operation is practically a continuous one, except for the intervals of time

necessarily consumed in operating on the 65 rings.

While the machine is wholly automatic in operation and requires no attention further than to keep the hopper supplied with rings, it will be seen that it is relatively simple and of inexpensive construction. The method of operating on the rings insures accurate uniform work and by reason of the high speed at which the machine can be operated it is capable of turning out a great
 75 volume of work.

What I claim as new is:

1. In grinding apparatus, the combination of an intermittently moving article carrier having a plurality of pockets adapted
 80 to receive and permit rotation of the articles to be ground, a rotary chuck located at a relatively fixed grinding station, and means for grinding the face of successive articles while rotated by said chuck during a period
 85 of rest of the carrier.

2. In grinding apparatus, the combination of an article carrier having a plurality of open pockets for the reception of the articles to be ground, an intermittent drive
 90 for the carrier, a table below the carrier, a rotary chuck also below the carrier, the organization being such that the carrier transports the articles over the table to the chuck, and grinding means operative over the
 95 chuck.

3. In grinding apparatus, the combination of a carrier wheel having a plurality of pockets adapted to receive and permit rotation of the articles to be ground, means for
 100 rotating the wheel intermittently, a rotary chuck located at a relatively fixed grinding station, and means for grinding the face of successive articles while rotated by said
 105 chuck during a period of rest of the carrier wheel.

4. In grinding apparatus, the combination of a carrier wheel having a plurality of open pockets for the reception of the articles to be ground, an intermittent drive
 110 for the carrier, a table beneath the wheel to support the articles, a rotary chuck located below the wheel at a relatively fixed grinding station to revolve the articles in the pockets while being ground.
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5. In grinding apparatus, a carrier having a plurality of open pockets, an intermittent drive for the carrier, a table beneath the carrier to support the articles transported by the carrier, a chuck located in a recess
 120 of the table to revolve the articles in the pockets while being ground, means for revolving the chuck, and a driven grinding disk thereover.

6. In grinding apparatus, an intermittently movable carrier wheel having open
 125 pockets for the articles to be ground, a table beneath the carrier wheel, and a rotary

chuck located in a recess of the table to revolve the articles in the pockets while being ground.

7. In grinding apparatus, a carrier having a plurality of open pockets for the reception of the articles to be ground, an intermittent drive for the carrier, a table beneath the same having a chuck recess and a discharge opening, a rotary chuck in the chuck recess, and a grinding disk over the chuck.

8. In grinding apparatus, an intermittently movable carrier wheel having open pockets for the articles to be ground, a table beneath the wheel to support the articles, means for placing the articles into the pockets at a fixed point, a rotary chuck located beneath the carrier at a different point, and grinding means operative over the chuck.

9. In grinding apparatus, an intermittently driven carrier having pockets adapted to receive and permit rotation of the articles to be ground, a rotary magnetic chuck located at a relatively fixed grinding station, and means for grinding the face of each successive article while rotated by said chuck during a period of rest of the carrier.

10. In grinding apparatus, a carrier for the articles to be ground, an intermittent drive therefor, a rotary magnetic chuck to which the articles are transported by the carrier, and means for energizing and deenergizing the chuck in accordance with the operation of the carrier.

11. In grinding apparatus, a traveling carrier having open pockets for the articles to be ground, a table beneath the carrier, a magnetic chuck onto which the carrier advances the articles from the table, and grinding means operative over the chuck.

12. In grinding apparatus, a carrier wheel having open pockets, an underlying table, a rotary magnetic chuck arranged to receive the rings from the table and to revolve the same in the pockets while being ground, an intermediate drive for the carrier wheel, and means for energizing and deenergizing the chuck in accordance with the operation of the carrier.

13. In grinding apparatus, a carrier having pockets adapted to receive and permit rotation of the articles to be ground, an intermittent drive for the carrier, a rotary chuck located at a relatively fixed grinding station, grinding means operative upon the faces of the successive articles revolved by the chuck, and means for moving said grinding means into and out of action in time with the movement of the carrier.

14. In grinding apparatus, an article carrier having open pockets, an underlying table, a rotary chuck to which the articles are advanced by the carrier, an intermittent drive for the carrier, grinding means op-

erative upon the faces of the successive articles revolved by the chuck, and mechanism coordinated with the carrier drive for moving said grinding means into and out of action.

15. In grinding apparatus, an article carrier, a rotary magnetic chuck, grinding means, an intermittent drive for the carrier, means for energizing and deenergizing the chuck, and means for moving the grinding means into and out of action, both in accordance with the operation of the carrier.

16. In grinding apparatus, a rotary chuck, a grinding disk cooperative therewith, means for intermittently transporting articles to be ground to the chuck, and mechanism connected with said means for traversing said grinding disk.

17. In grinding apparatus, a rotary chuck, an intermittently movable carrier for transporting the articles to be ground to the chuck, a grinding disk, and means for traversing said grinding disk during the periods of rest of the carrier.

18. In grinding apparatus, a rotary magnetic chuck, an intermittently movable carrier for transporting articles to be ground to the chuck, grinding means cooperative with the chuck, and means for energizing and deenergizing said chuck toward the beginning and end of the periods of rest of the carrier.

19. In grinding apparatus, a carrier wheel for the articles to be ground, a magnetic chuck to which the articles are transported by the wheel, means for rotating the carrier wheel intermittently and the chuck continuously, and means for automatically energizing and deenergizing the chuck toward the beginning and end of the periods of rest of the carrier wheel.

20. In grinding apparatus, a carrier wheel having open pockets for the reception of the articles to be ground, an underlying table, a rotary magnetic chuck adapted to receive the articles from the table, grinding means cooperative with the chuck, means for energizing and deenergizing the chuck, and means for moving the grinding means into and out of action, both in time with the movements of the carrier wheel.

21. In grinding apparatus, a carrier wheel having open pockets for the reception of the articles to be ground, an article magazine, means for delivering articles therefrom to the pockets, a table underlying the wheel, and a rotary chuck arranged to receive the articles from the table and to rotate the same in the pockets of the wheel while being ground.

22. In grinding apparatus, a carrier wheel having open pockets, an underlying table, and a rotary magnetic chuck located at a grinding station and lying approximately

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in the plane of the table to rotate the articles in the pockets while being ground.

23. In grinding apparatus, a carrier for the articles to be ground, means for grinding the articles upon one face, and a discharge chute having means therein for delivering the articles in reversed position.

24. In grinding apparatus, a carrier having open pockets for the articles to be ground, an underlying table, a chuck also beneath the carrier for revolving the articles in the pockets while being ground, and means for delivering and reversing the articles by gravity.

25. In grinding apparatus, a carrier having open pockets for the articles to be ground, an underlying table, a chuck also beneath the carrier for revolving the articles in the pockets, grinding means over the chuck, said table having a discharge opening, and means in said opening for reversing the articles.

26. In grinding apparatus, a carrier for the articles to be ground, a chuck beneath the carrier for rotating the articles while being ground, and a discharge chute having a ledge for reversing the articles.

27. In grinding apparatus, a carrier wheel having open pockets for the articles to be ground, an underlying table, a chuck located in a recess of the table for revolving the articles in the pockets while being ground, the table having a discharge opening at another point, and a ledge adjacent said opening for reversing the articles as they drop there-through.

28. In grinding apparatus, a carrier having open pockets for the articles to be ground, an intermittent drive for the carrier, an underlying support over which the carrier transports the articles, a rotary chuck located at one point beneath the path of the articles in the carrier, grinding means operative over said chuck, the underlying support ceasing at a further point in the relation to the travel of the articles in order to permit the latter to be discharged by gravity, and a stationary member over this region adapted to engage displaced articles and insure their delivery.

29. In a machine of the character set forth, the combination of an intermittently rotating carrier wheel, a plurality of rotatable article holders mounted on said wheel, a rotating article-holding chuck disposed at a fixed station to revolve the articles in said holders, and a grinding element arranged to operate on the ring elements held by said rotating chuck.

30. In a machine of the character set forth, a supporting table having an opening therein, a rotating magnetic chuck working in said opening, a carrier wheel above said table provided with pockets extending entirely therethrough, means for charging ring elements into said pockets at a point above the table, means for rotating the carrier wheel to advance the ring elements in the pockets over the table onto the rotating magnetic chuck, and a grinding element above the magnetic chuck.

31. In a machine of the character set forth, a supporting table having an opening therein, a rotating magnetic chuck, a carrier wheel above said table provided with pockets extending entirely therethrough, means for charging ring elements into said pockets at a point above the table, means for rotating the carrier wheel intermittently to advance the ring elements in the pockets over the table onto the rotating magnetic chuck and from said rotating chuck to a discharge point, and means for electrically energizing the chuck when said pockets are over the same and deenergizing said chuck when said pockets are to be moved onto the discharge point.

32. In combination with grinding means, a table, a carrier rotating above said table and provided with article-receiving pockets extending entirely therethrough, said table having a discharge opening therein beyond the grinding station with which opening the pockets in the carrier register in the rotation of the carrier, and a shelf extending part way across said discharge opening for tilting the articles dropping from said pockets into said discharge opening.

33. In combination with grinding means, a table, a carrier rotating above said table and provided with article-receiving pockets extending entirely therethrough, said table having a discharge opening therein beyond the grinding station with which opening the pockets in the carrier register in the rotation of the carrier, a shelf extending part way across said discharge opening for tilting the articles dropping from said pockets into said discharge opening, and a guard above the carrier overlying the discharge opening in the table.

In testimony whereof, I have signed my name to this specification in the presence of two subscribing witnesses.

ZENO LITTMAN.

Witnesses:

WALDEMAR H. CHADBOURNE,
CHARLES A. BUCKLEY.