March 1, 1932. G. W. BINNS 1,847,466

GRINDING MACHINERY

Filed June 4, 1929 3 Sheets-Sheet 1

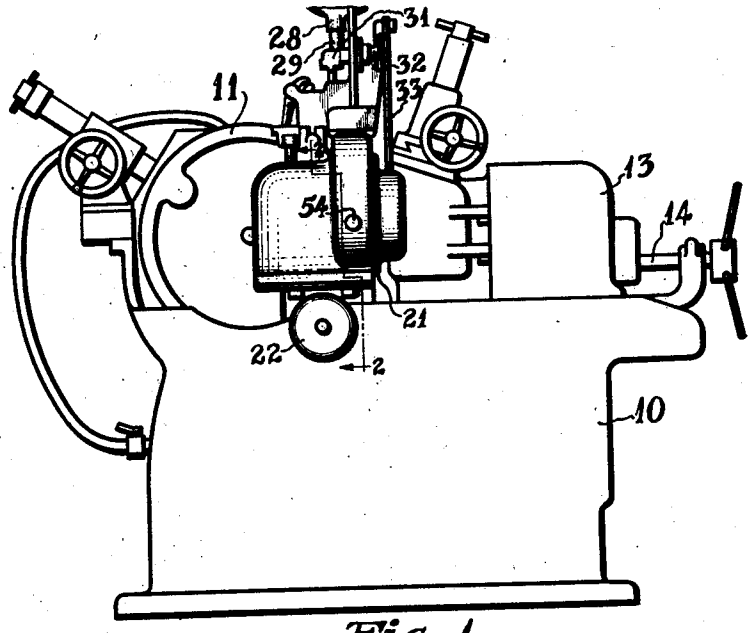


Fig. 1

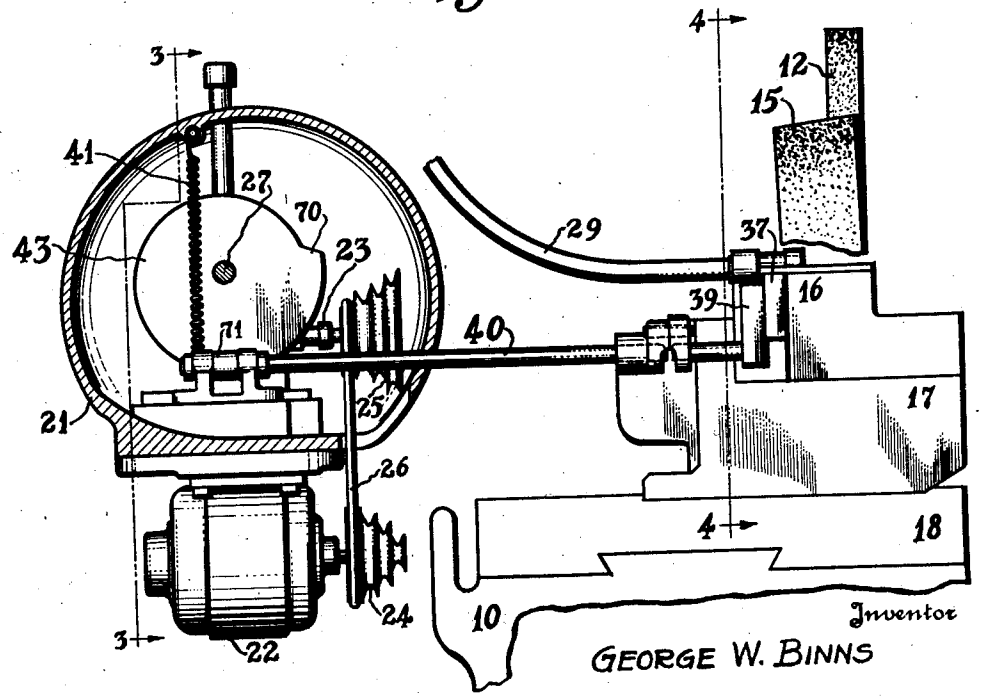


Fig. 2

Inventor
GEORGE W. BINNS

By O'K Parsons
Attorney

March 1, 1932. G. W. BINNS 1,847,466

GRINDING MACHINERY

Filed June 4, 1929 3 Sheets-Sheet 2

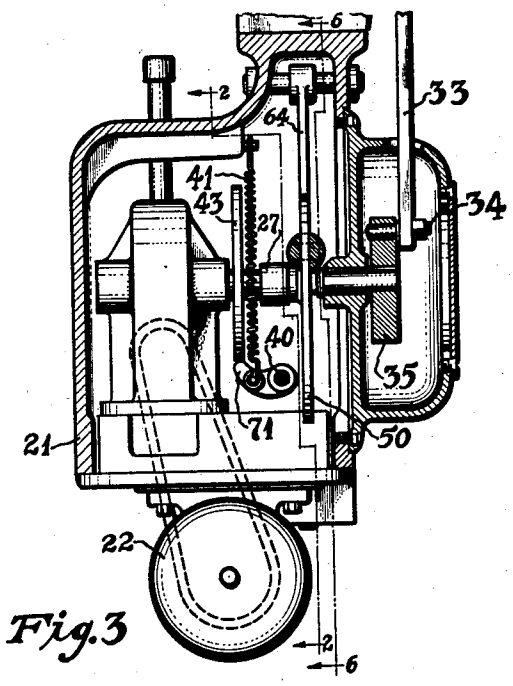


Fig. 3

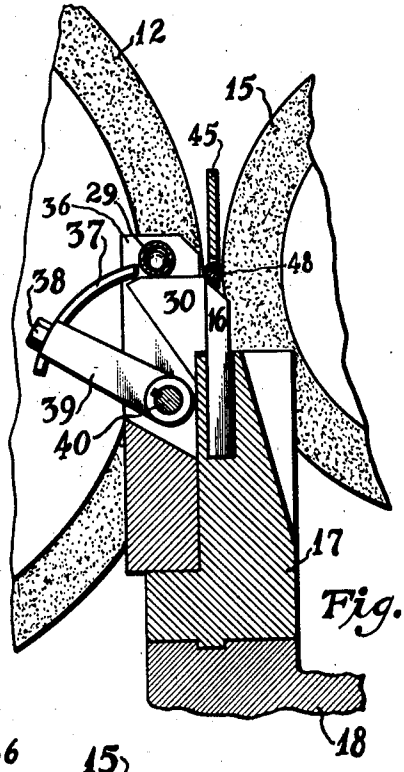


Fig. 4

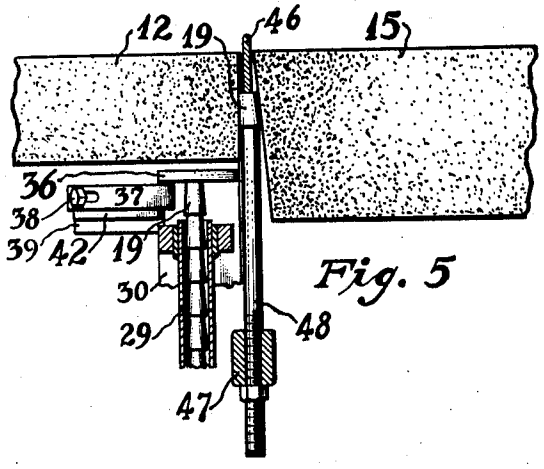


Fig. 5

Inventor

GEORGE W. BINNS

By O. M. Parsons

Attorney

March 1, 1932. G. W. BINNS 1,847,466

GRINDING MACHINERY

Filed June 4, 1929 3 Sheets-Sheet 3

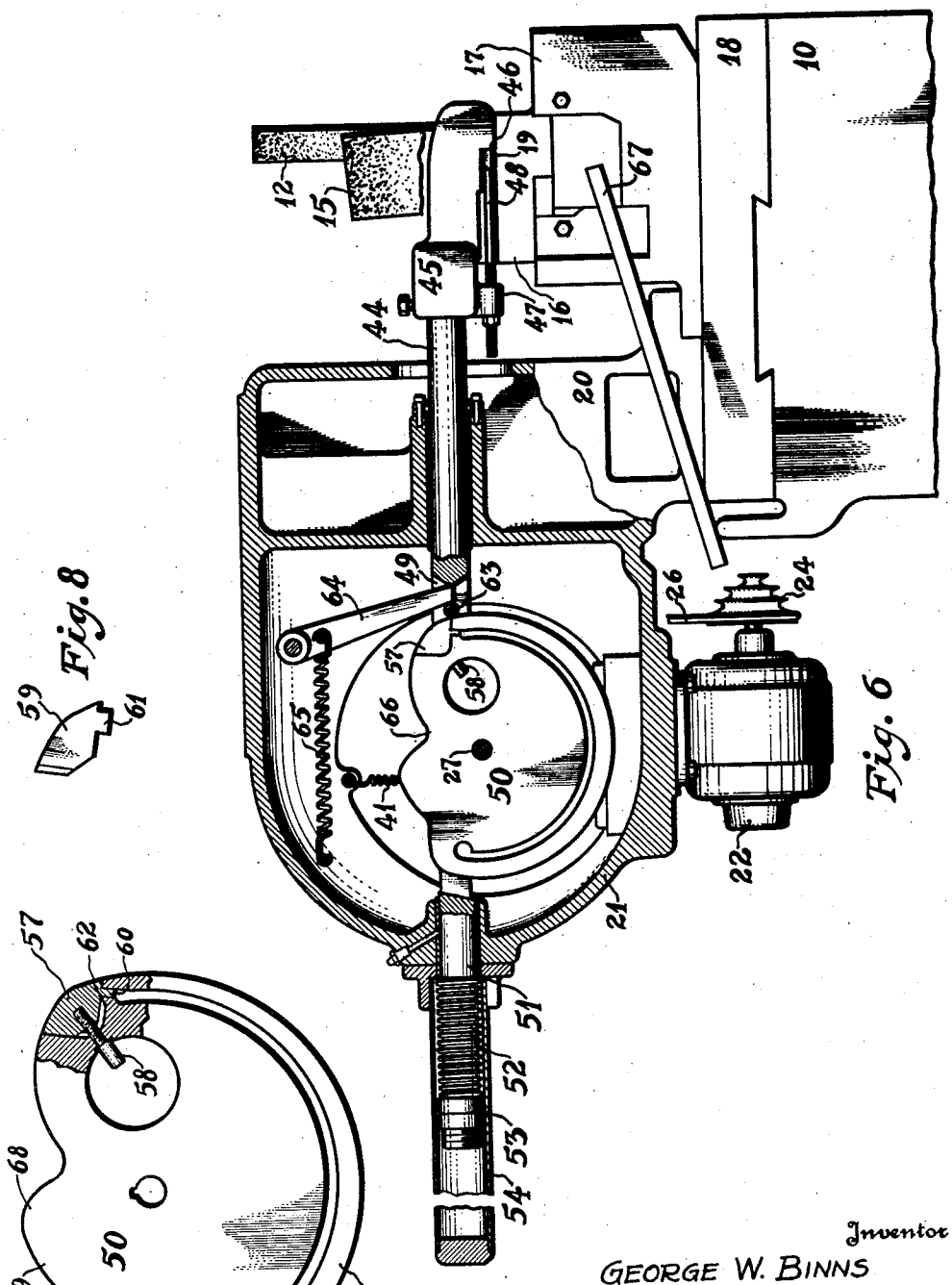


Fig. 6

Fig. 8

Fig. 7

Inventor

GEORGE W. BINNS

By H. K. Parsons

Attorney

Patented Mar. 1, 1932 1,847,466

UNITED STATES PATENT OFFICE

GEORGE W. BINNS, OF CINCINNATI, OHIO, ASSIGNOR TO CINCINNATI GRINDERS INCORPORATED, OF CINCINNATI, OHIO, A CORPORATION OF OHIO

GRINDING MACHINERY

Application filed June 4, 1929. Serial No. 368,260.

This invention relates to improvements in centerless grinding machinery and more especially to the manner of presentation of work to the grinding throat thereof.

One of the principal objects of the present invention is the provision of an automatic mechanism for proper supplying of non-cylindrical work pieces to a grinding machine of this nature and the subsequent discharge thereof.

A further object of the invention is the provision of improved means for adjustably determining the amount or rate of grinding to be performed on a work piece.

An additional object of the invention is the provision of an improved automatic mechanism for positively supplying a work piece in position for engagement by the feed mechanism proper of the machine and for subsequently axially introducing the supplied work to and retracting it from the grinding throat.

A further object of the invention is the provision of an improved synchronizing mechanism for controlling the entire movement of the work from the hopper or source of supply therefor through the machine in grinding and final discharge.

Other objects and advantages of the present invention should be readily apparent by reference to the following specification, considered in conjunction with the accompanying drawings, and it will be understood that I may make any modifications in the specific structural details hereinafter described, within the scope of the appended claims, without departing from or exceeding the spirit of the invention.

Figure 1 is a front elevation of a machine embodying the invention.

Figure 2 is a transverse section as on line 2—2 of Figures 1 and 3.

Figure 3 is a section on line 3—3 of Figure 2.

Figure 4 is a section on line 4—4 of Figure 2.

Figure 5 is a view of the grinding throat with the supply tube shown in section.

Figure 6 is a section illustrating the adjustable cam and parts actuated thereby as on line 6—6 of Figure 3.

Figure 7 is a detail of the adjustable cam member, and

Figure 8 a view of an alternatively employable cam expenditure block.

In the drawings, in which similar characters of reference are employed to denote corresponding parts throughout the several views, the numeral 10 designates the bed of a centerless grinder having the wheel head 11 in which is rotatably supported the grinding wheel 12 operable at a high grinding rate of speed in a clockwise direction for effecting suitable stock removal of the part to be operated upon.

Disposed on the bed, in opposition to the grinding wheel head, is the regulating wheel unit 13 supported for in and out adjustment as by screw 14. This unit includes the angularly adjustable regulating wheel member 15, operable at a slow rate of rotation in a clockwise direction to cause its inner work engaging periphery to move upwardly with respect to the work piece during grinding, to present a progressively moving friction surface insuring constant and uniform rotation of the work. At the same time an angle or tilt of the regulating wheel causes it to exert a feed component, axially urging the work longitudinally of the work rest blade 16. This blade is suitably mounted on the bracket 17 carried by slide member 18 with which the regulating wheel unit moves.

The present invention relates particularly to what is known in the art as in-feed grinding of the type in which the grinding and regulating wheels and work rest together form a throat for reception and operation upon the work and in which the work is shifted into and out of the grinding throat while the same is maintained a constant width. As illustrated, the invention is utilized in the grinding of tapered work pieces 19, such as rolls for roller bearings, the stock removal therefor being effected by an urge of the work piece from a wider to narrower portion of the throat, the surface of one or both wheels having a suitably tapered form thereon so that the included taper between the throat forming members is that to

be produced on the finished work piece. It is to be understood, however, that the feed and control mechanism hereinafter described is capable of utilization in connection with other shapes of articles, either plain or irregular in contour, the wheels being suitably shaped for operation thereon and being relatively moved in accordance with standard commercial brackets, either manually as by rotation of screw 14 or by suitable automatic mechanism if preferred.

In the present instance, there has been shown mounted on slide 18, a supplemental bracket 20 supporting the housing 21, from which depends drive motor 22 coupled with shaft 23 through the intervention of suitable change speed drive mechanism which, in the present instance, has been shown as comprising pulleys 24 and 25 and intermediate belt 26. Shaft 23 is operably associated with cam shaft 27 for actuation of the latter, to control the several feed and discharge movements of the machine.

The work pieces are designed to be placed within a hopper, as at 28, and fed downward through tube 29 to the outwardly inclined work receiving table 30. Their progress to this table is controlled by a selector mechanism 31 having an arm 32 coupled by link 33 and eccentric pin 34 with disc 35 on shaft 27.

As the work pieces under control of this mechanism move downward in tube 29, the tapered work piece 19 will be fed out onto the table or support 30 beyond the end of the tube and abutting the end stop 36, the inclination of the table urging the piece outward against the arcuate pusher finger 37, adjustably secured by bolt 38 to arm 39 on shaft 40. A spring 41 urges the arm in a clockwise direction to cause the pusher to spring across the table, this portion 42 blocking off movement of the succeeding series of work pieces, while the individual work piece is caused to roll down onto the angle top work rest blade 16 and against the opposed surface of the regulating wheel 15. The movement of the pusher arm is controlled by cam 43 of shaft 27 in proper timed relation or synchronism with the movement of the other work feeding parts.

These parts are particularly illustrated in Figure 6 of the drawings and include a reciprocable plunger 44 having an inner head 45 including a hook-shaped work engaging portion 46. This is designed to terminally engage a work piece, limiting its movement axially in the grinding throat and engaging the work piece to positively withdraw it from the throat.

The head is further provided with a lug 47, in which is adjustably mounted the pusher 48 which serves to normally force the work inward in the throat for proper grinding thereof. This plunger is slotted as at 49, spanning the control cam 50, also carried by shaft 27. Beyond the cam the plunger has a terminal portion 51, on which is mounted the reciprocating spring 52 serving to urge the plunger outward. This spring bears at the one end against housing 21 and at the opposite end against the ends 53 of the plunger, a tubular casing 54 serving to enclose these parts.

Cam 50 has been shown in detail in Figure 7 and comprises a main body portion of irregular contour having an arcuate slot 55 forming an outer flexible semi-circular finger 56 interlocking at its free end with the detachable adjustment block 57. This block may be suitably retained in position as by screw 58. The block may be removed and different blocks, such as 59, substituted in place thereof, the various blocks having lugs as at 60 and 61 of different widths interposable between the terminus of the finger and the body of the cam 50 for outward deflection of the finger whereby the effective curvature of this portion of the periphery of the cam may be suitably varied. In addition, the block is capable of limited tilting movement about the point 62 as a fulcrum as the screw is tightened. This provides for minor variations in cam outline of less degree than those obtainable by interposition of the different substitutable adjustment blocks of the series, so that quite fine variations of effective cam surfaces may be secured.

In Figure 6 the cam is shown in a position occupied at the completion of the grinding and with the work head within the grinding throat. Continued rotation of the cam in a clockwise direction will cause the abutment roller or pin 63 on plunger 44 to ride downward on the cam under the influence of lever 64 actuated by spring 65. This moving continues until abutment 63 reaches low point 66 of the cam, when the work will have been retracted beyond its support by the work rest and regulating wheel, and is free to drop into the discharge chute 67. Riser 68 of the cam then becomes effective to reversely shift the plunger into alignment with work piece 19 on table 30, when there is a feed period dwell due to the concentric formation of the cam surface at 69. As shaft 27 is rotated about this point, receiving portion 70 of cam 43 releases its restraining pressure on finger 71 of rock shaft 40, when the same is oscillated by spring 41 and pusher 42 shifts the work piece onto the work rest in operative position between head terminus 46 and plunger 48. As rotation of shaft 27 continues, abutment 63 will be moved inwardly by riser 72 of the cam until the work piece is in grinding position. It will then be fed axially into the throat, as determined by the contour of portion 56 of the cam, at a gradual rate, terminating in a dwell, for final sparking out to size, after which the completed work piece will be withdrawn, allowed to

discharge by gravity into chute 67 and the cycle repeated with the next of the series.

From the foregoing description, it will be seen that there has been provided a completely automatic machine for the successive grinding of a series of non-cylindrical pieces such as tapered rolls for roller bearings, in which the work pieces may be deposited in a suitable hopper and a combined power operated control mechanism will be effective to regulate the discharge of work pieces from the hopper, the feeding of discharged work pieces individually to a transfer mechanism which serves to successively move the same into and out of a grinding throat for operation thereon.

It will further be noted that improved means have been provided for variably determining the effective movement of the work shifting member, comprising a cam having a variable outer surface together with means for modifying the curvature thereof.

I claim:

1. The combination with a centerless grinder, including opposed grinding and regulating wheels and an intermediate work rest, of means for determining the automatic cyclic operation thereof including a work supplying hopper, a discharge chute extending from the hopper, a series of work transfer mechanisms for transferring the work from the discharge chute to the work rest, and power operated cam members for synchronously actuating said mechanisms.

2. The combination with a centerless grinder, including opposed grinding and regulating wheels and an intermediate work rest, of reciprocable means for moving a work piece into and out of the throat between said wheels, and means for transversely shifting a work piece into the path of said reciprocable work controlling member.

3. The combination with a centerless grinder, including opposed grinding and regulating wheels and an intermediate work rest, of reciprocable means for moving a work piece into and out of the throat between said wheels, means for transversely shifting a work piece into the path of said reciprocable work controlling member, and power operated cam mechanisms for controlling the sequential shiftings of an individual work piece.

4. The combination with a centerless grinder, including opposed grinding and regulating wheels and an intermediate work rest, of reciprocable means for moving a work piece into and out of the throat between said wheels, means for transversely shifting a work piece into the path of said reciprocable work controlling member, power operated cam mechanisms for controlling the sequential shiftings of an individual work piece, and means for adjustably determining the effective curvature of one of said cam mechanisms.

5. The combination with a centerless grinder, including opposed grinding and regulating wheels and an intermediate work rest, of reciprocable means for moving a work piece into and out of the throat between said wheels, means for transversely shifting a work piece into the path of said reciprocable work controlling member, power operated cam mechanisms for controlling the sequential shiftings of an individual work piece, and means for resiliently maintaining the mechanisms in engagement with the cam actuators therefor.

6. The combination with a centerless grinder, including opposed grinding and regulating wheels and an intermediate work rest forming a grinding throat therebetween, of a hopper, a work discharge chute leading from said hopper, a support for a discharged work piece, a work feed mechanism adjacent the support, means for transferring work from the support to the feed mechanism, a power driven shaft, and connections between the shaft and the hopper, the transfer mechanism and the feed mechanism for controlling the successive advance of a work piece to the grinding throat.

7. A centerless grinder including a regulating wheel, an opposed grinding wheel of less width than that of the regulating wheel forming therewith a work receiving throat with the regulating wheel projecting laterally to one side of the throat, a work rest subtending the throat for supporting a work piece in operative relation to the wheels, a work support adjacent the grinding wheel in opposition to the laterally projecting portion of the regulating wheel, and means for transversely shifting a work piece on the support into engagement with the regulating wheel.

8. A centerless grinder including a regulating wheel, an opposed grinding wheel of less width than that of the regulating wheel forming therewith a work receiving throat with the regulating wheel projecting laterally to one side of the throat, a work rest sub-tending the throat for supporting a work piece in operative relation to the wheels, a work supporting adjacent the grinding wheel in opposition to the laterally projecting portion of the regulating wheel, means for transversely shifting a work piece on the support into engagement with the regulating wheel, the work rest having an extension adjacent the regulating wheel and having its upper surface inclined in the direction of the regulating wheel to form therewith a trough for reception of the work piece as it is shifted toward the regulating wheel.

9. A centerless grinder including a regulating wheel, an opposed grinding wheel of less width than that of the regulating wheel forming therewith a work receiving throat

with the regulating wheel projecting laterally to one side of the throat, a work rest subtending the throat for supporting a work piece in operative relation to the wheels, a work support adjacent the grinding wheel in opposition to the laterally projecting portion of the regulating wheel, means for transversely shifting a work piece on the support into engagement with the regulating wheel, the work rest having an extension adjacent the regulating wheel and having its upper surface inclined in the direction of the regulating wheel to form therewith a trough for reception of the work piece as it is shifted toward the regulating wheel, and means for shifting the displaced work piece longitudinally of the trough into grinding position within the throat.

10. A centerless grinder including a regulating wheel, an opposed grinding wheel of less width than that of the regulating wheel forming therewith a work receiving throat with the regulating wheel projecting laterally to one side of the throat, a work rest subtending the throat for supporting a work piece in operative relation to the wheels, a work support adjacent the grinding wheel in opposition to the laterally projecting portion of the regulating wheel, means for transversely shifting a work piece on the support into engagement with the regulating wheel, the work rest having an extension adjacent the regulating wheel and having its upper surface inclined in the direction of the regulating wheel to form therewith a trough for reception of the work piece as it is shifted toward the regulating wheel, means for shifting the displaced work piece longitudinally of the trough into grinding position within the throat, a rotatable shaft, and control members carried by the shaft for sequentially operating the various work shifting members.

11. A centerless grinder including a regulating wheel, an opposed grinding wheel of less width than that of the regulating wheel forming therewith a work receiving throat with the regulating wheel projecting laterally to one side of the throat, a work rest subtending the throat for supporting a work piece in operative relation to the wheels, a work support adjacent the grinding wheel in opposition to the laterally projecting portion of the regulating wheel, means for transversely shifting a work piece on the support into engagement with the regulating wheel, the work rest having an extension adjacent the regulating wheel and having its upper surface inclined in the direction of the regulating wheel to form therewith a trough for reception of the work piece as it is shifted toward the regulating wheel, means for shifting the displaced work piece longitudinally of the trough into grinding position within the throat, a rotatable shaft, control members carried by the shaft for sequentially operating the various work shifting members, a power drive for the shaft, and means for variably determining the rate of rotation thereof.

12. In a mechanism of the character described the combination with a work feeding device, of an actuating cam therefor comprising a body portion having an arcuate slot formed near the periphery thereof to provide a resilient circumscribing finger, and means for adjustably determining the relationship of the finger to the body portion whereby the operative effect of the cam may be modified.

13. In a mechanism of the character described the combination with a work feeding device, of an actuating cam therefor comprising a body portion having an arcuate slot formed near the periphery thereof to provide a resilient circumscribing finger, means for adjustably determining the relationship of the finger to the body portion whereby the operative effect of the cam may be modified, said means including a wedge block, and means for securing the wedge block in interposed relation to the body portion and finger.

14. An adjustable cam of the nature disclosed including a body portion and a spaced yieldable finger extending about a portion of the periphery thereof, the body portion having a seat formed therein adjacent the end of the finger, a spacing member having a portion conforming to the seat and a filler lug interposable between the finger and the body portion of the cam for adjustably securing the parts in predetermined spaced relation, and means for securing the block in position within the seat.

15. A machine of the character described including opposed grinding and regulating wheels forming a work receiving throat therebetween, a work rest sub-tending the throat for support of a work piece during grinding thereof, a work support adjacent the rest outside the throat, an oscillatable member for shifting a work piece from the support to the rest, and a reciprocable member movable longitudinally of the rest having a work piece receiving recess whereby the work piece will be given a back and forth movement in the throat thereby.

16. A machine of the character described including opposed grinding and regulating wheels forming a work receiving throat therebetween, a work rest sub-tending the throat for support of a work piece during grinding thereof, a work support adjacent the rest outside the throat, an oscillatable member for shifting a work piece from the support to the rest, a reciprocable member movable longitudinally of the rest having a work piece receiving recess whereby the

work piece will be given a back and forth movement in the throat thereby, and means for automatically imparting a cyclic movement to the reciprocating member including a retraction beyond the work feeding mechanism for discharge of a work piece, an inward movement and dwell adjacent the oscillatable work supplying member to facilitate engagement of a work piece in the recess thereof, and a subsequent movement of the contained work piece into grinding position within the throat followed by retracting ejecting movement thereof.

In testimony whereof I affix my signature.

GEORGE W. BINNS.