Dec. 11, 1934. C. W. HOPKINS 1,983,853

GRINDING MACHINE

Filed Jan. 10, 1930 2 Sheets-Sheet 1

Fig. 1

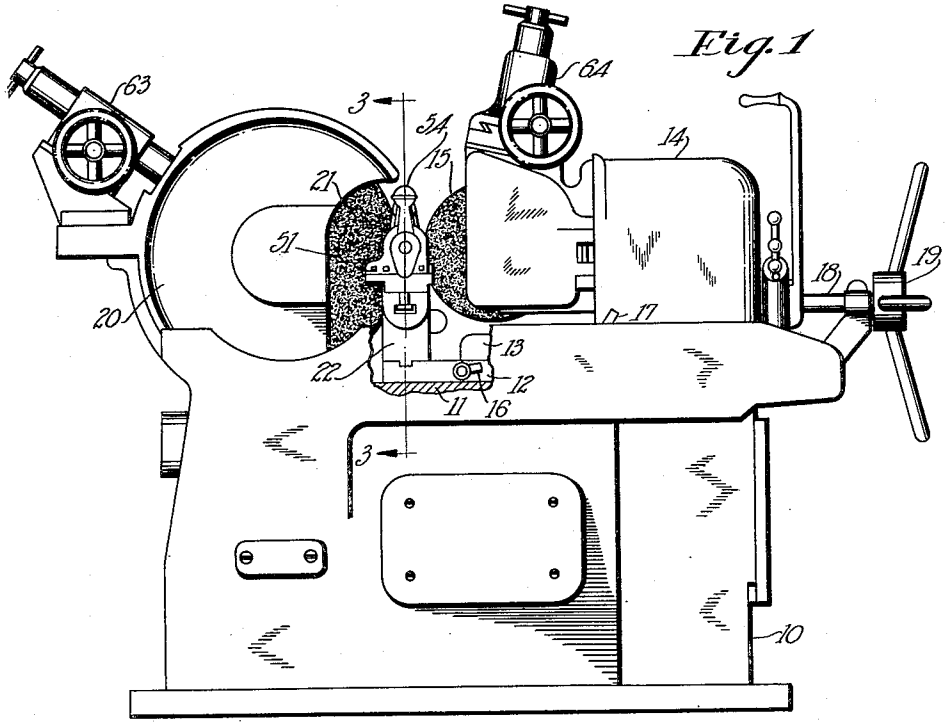
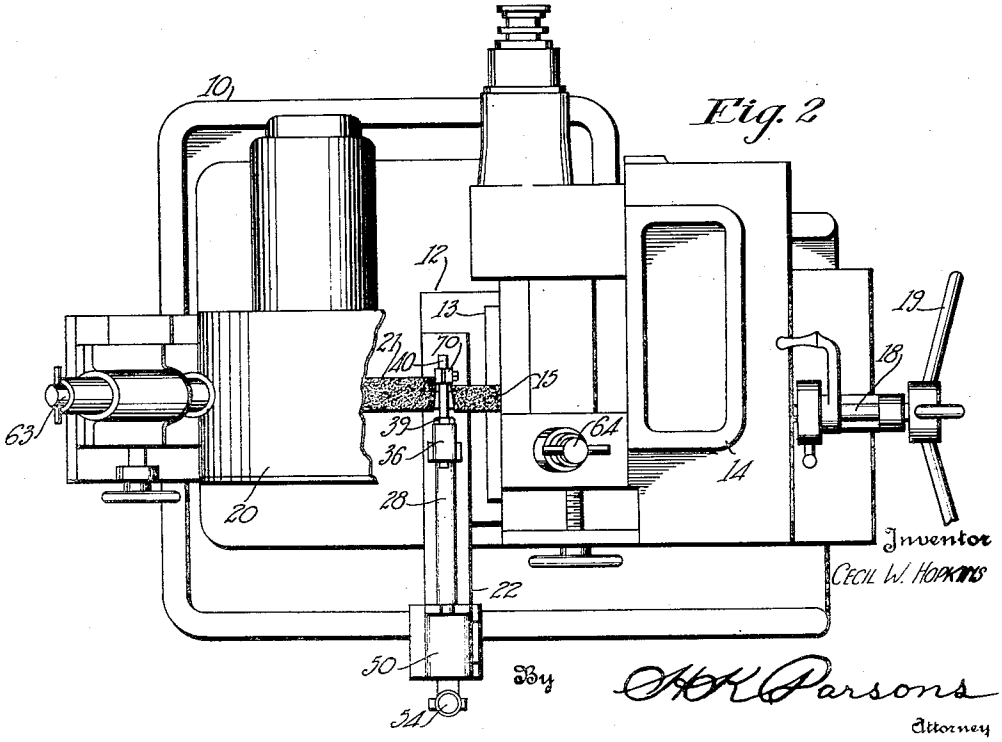


Fig. 2



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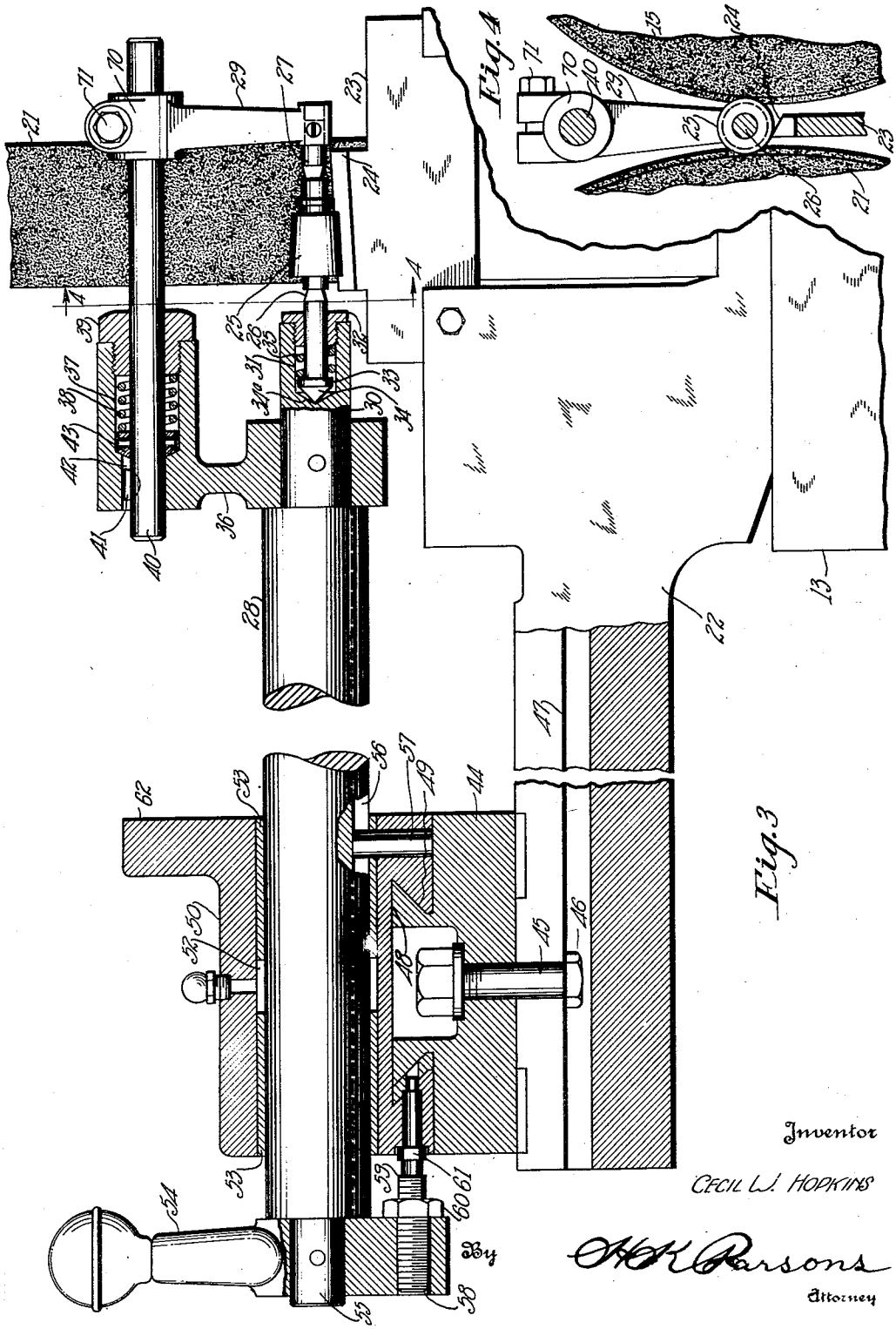


Fig. 3

Fig. 4

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1,983,853

GRINDING MACHINE

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Application January 10, 1930, Serial No. 419,961

14 Claims. (Cl. 51—103)

This invention relates to improvements in grinding machines and especially to improvements in centerless grinders.

An object of the invention is to provide in a centerless grinder, improved means for placing a work piece in the grinding throat and removing same therefrom.

Another object of the invention is to provide improved means for finishing, by the centerless grinder method, tapered or other formed work pieces.

Another object of the invention is to provide a centerless grinder for properly automatically finishing tapered or other formed work pieces to a predetermined size and form.

Other objects and advantages of this invention should be readily apparent by referring to the following specification, considered in conjunction with the accompanying drawings forming a part thereof, but it is to be understood that any modifications may be made in the specific structural details thereof, within the scope of the appended claims, without departing from or exceeding the spirit of the invention.

In the drawings:

Figure 1 is a front elevation of a centerless grinder embodying the improvements of this invention;

Figure 2 is a top plan view of the device shown in Figure 1;

Figure 3 is a transverse sectional view through the grinding throat taken substantially on line 3—3 of Figure 1; and

Figure 4 is a sectional view taken on line 4—4 of Figure 3.

Throughout the various views of the drawings, similar reference characters are employed to denote the same or similar parts.

In general, a centerless grinder comprises a bed 10 having formed thereon ways 11 supporting a slide 12 for adjustment toward and from the grinding wheel, which slide 12 in turn supports, for relative adjustment thereto, a second slide 13. Slide 13 supports the regulating wheel unit 14 rotatably supporting regulating wheel 15. Clamps 16 and 17 are provided, for respectively securing the lower slide 12 to the bed 10 and the upper slide 13 to the slide 12. A feed screw 18 having a pilot wheel 19 may be provided, for adjusting the said slides 12 and 13 relative to one another and to the bed 10. A grinding wheel unit 20 is also supported by the bed 10 in position to have the grinding wheel 21 thereof rotatable in peripheral opposition to the regulating wheel 15. The grinding wheel 21 is rotated in a clockwise direction, as indicated by the arrow on the housing, at a relatively rapid rate of speed to effect a stock removal from a work piece, while the regulating wheel 15 rotates also in a clockwise direction but at a relatively slower rate of speed for controlling the rotation of the work piece during grinding. These wheels 15 and 21 are adapted to be adjusted toward and from one another to determine the size of the grinding throat and of the work piece therein.

The foregoing description deals with the standard centerless grinder to which the improved mechanism of this invention has been applied. This invention pertains primarily to the means for inserting and withdrawing a work piece from the grinding throat, and to this end, comprises a supporting block 22 adjustably carried by the forward end of lower slide 12. The block 22, at its inner end, supports a work rest blade 23 having an angle top 24, for peripherally supporting a work piece 25 during rotation. The active face or top 24 of the blade 23 is inclined toward the regulating wheel to prevent inadvertent engagement between the said work and the grinding wheel.

The work piece 25 is adapted to be rotated on centers 26 and 27, respectively carried by an actuating bar 28 and depending arm 29. The actuating bar 28 is provided with a reduced portion 30 having a counterbore 31 therein to receive the said center 26. A cap or plug 32 is threadedly received in the end of counterbore 31 and forms a guide sleeve for the center 26. A head 33 having a centering point 34, is formed on the end of center 26 forming one abutment for a spring 35, abutting on its opposite end with the sleeve 32. The centering point 34 is received in a seat 34a so that a floating center is provided whereby the work piece may be forced into engagement with the top of the work rest blade to take up the grinding thrust thereon. The reduced portion 30, in addition, has secured thereto an upstanding arm 36 in which a bore 37 is provided for housing a spring 38. A bearing nut 39 is threadedly received in the end of bore 37 and forms a guide sleeve for sliding shaft 40. A key 41, carried by the shaft 40 and interfitting with a keyway 42 formed in the end of the bore 37, prevents relative rotative movement between the arm 36 and sliding shaft 40 but permits said shaft to be slidably actuated axially thereof. A head 43 is secured to the slide shaft 40 internally of the bore 37 and forms one abutment for the spring 38 which abuts, on its opposite end, with the guide sleeve 39. Shaft 40 has adjustably se-

cured to its other end the arm 29 which carries the fixed center 27. This arm 29 is provided with a split collar 70 having a bore therein to receive the said slide shaft 40, and a clamp bolt 71 is provided, for clamping the split collar 70 to the shaft in various adjusted positions to adjust the distance between the centers 26 and 27.

From the foregoing description it will be noted that the work piece 25 is yieldably supported between the centers in such a way that no interference is offered to the rotation of the work or its control by the grinding and regulating wheels. To insert and withdraw the work piece from the grinding throat, the block 22 is provided on its outer end with a guide bracket 44, from which a clamp bolt 45 extends having the head 46 thereof received in a T-slot 47 formed longitudinally of the block 22. The bracket 44 is provided with a dovetailed guide 48 received in a correspondingly shaped guideway 49 formed on the under side of main bearing 50. Clamp screws 51, shown in Figure 1, are employed for locking the bearing 50 relative to the bracket 44 after it has been adjusted to the desired position. Bearing 50 is provided with a bore 52 therethrough, for receiving bushings 53 through which the actuating bar 28 is adapted to be slidably shifted. For this purpose, a handle 54 is pinned, or otherwise secured, to a reduced portion 55 thereof. A spline 56 is formed longitudinally of the bar 28 and receives a guide pin 57 to prevent rotative movement of the actuating bar 28 while permitting unrestricted axial longitudinal movement thereof. Handle 54 is provided with a threaded perforation 58 threadedly receiving stud 59 locked in place by locking nut 60, which stud 59 is adapted to engage a stop 61 limiting the inward shifting of the actuating bar 28. Bearing 50 is further provided on its inner end with an upstanding flange 62 to be engaged by the end of slide shaft 40 for compressing the spring 38 and shift arm 29 and center 27 away from center 26 to release the work piece.

The complete operation of the device is as follows: Grinding wheel 21 and regulating wheel 15 are each provided with the usual truing structures 63 and 64 respectively, for properly truing or forming the active opposed faces thereof. In the machine shown in the drawings, the faces of the wheels are tapered toward one another for taper grinding a work piece such as the valve body of a tapered key valve. Clamps 16 and 17 are opened and the slides 11 and 12 adjusted through the pilot wheel 19 and screw 18 to bring the axial center of actuating bar 28 and work supporting centers 26 and 27 concentric to the center of the finished work piece and so that the grinding and regulating wheels are spaced apart a distance sufficient to provide a grinding throat of the exact size to which the work piece is to be reduced when the stud 59 and stop 61 are in engagement. A work piece, such as 25, is then placed between the centers 26 and 27 having their axial centers in substantial alignment and the actuating bar 28, through the handle 24, is shifted a distance to disengage the end of slide shaft 40 from the flange 62, whereupon spring 38 will shift center 27 into engagement with the work piece. Continued actuation of bar 28 axially injects the work piece into the grinding throat to effect a stock removal therefrom. This movement of the work piece continues until stud 59 engages the stop 61 which limits the grinding on the work piece. Stud 59 and stop 61 are so related, one to the other, that upon engagement, the work piece is reduced to proper form and size. The handle 54 is now utilized for reversely shifting bar 28 to withdraw the finished work piece from the grinding throat. This reverse movement of bar 28 continues until the end of slide shaft 40 engages with flange 62 for separating the centers 26 and 27 and allowing the work piece to fall, by gravity, from the grinding position.

The foregoing operation can be expeditiously performed by an operator, whose position is just to the right of the loading fixture, having a supply of unfinished work pieces within reach of his right hand, with which the said unfinished pieces are placed in substantial alignment with centers 26 and 27, as above described. With his left hand grasping the handle 24, the operator inserts the unfinished work piece within the grinding throat and withdraws same therefrom. A suitable receiving receptacle may be positioned to receive the finished work pieces as they drop, by gravity, from between their terminal engaging centers.

What is claimed is:

1. In a centerless grinder the combination of a pair of opposed grinding and regulating wheels forming a grinding throat therebetween, the wheels having active peripheral faces inclined one to the other to form a work piece of prescribed taper, a work rest blade within the grinding throat peripherally supporting the work in opposition to the thrust of the grinding wheel during grinding, centers terminally engaging and supporting the work, and means for inserting and withdrawing the centers and work from the grinding throat to place the work on and remove same from the blade.

2. In a centerless grinder the combination of a grinding wheel rotatable at a high grinding rate of speed having an active peripheral face of prescribed inclination, a regulating wheel in opposition thereto and rotatable at a slow work controlling rate of speed having an active peripheral face inclined opposite to that of the regulating wheel, means treminally engaging and supporting the work within the grinding throat and in joint engagement with the active faces of the grinding and regulating wheels whereby one of the wheels will shape the work to prescribed taper while the other wheel will control its rotation, and means peripherally engaging the work to take up the grinding thrust thereagainst.

3. In a centerless grinder the combination with a grinding throat, of a work support for peripherally supporting a work piece and means terminally engaging and supporting the work during rotation, said means comprising a pair of centers, means yieldingly urging the centers toward one another into engagement with the work, means supporting the centers and yielding means, and means for actuating the said centers and yielding means axially of the grinding throat to place the work on and remove same from the peripheral support.

4. In a centerless grinder the combination with a grinding throat, of a work support for peripherally supporting a work piece and means terminally engaging and supporting the work during rotation, said means comprising a pair of centers, means yieldingly urging the centers toward one another into engagement with the work, means supporting the centers and yielding means, means for actuating the said centers and yielding means axially of the grinding throat to place a work piece on and remove same from

the peripheral support, and means limiting the insertion of the work to control the final size thereof.

5. In a centerless grinder the combination with a grinding throat, of a work support for peripherally supporting a work piece and means terminally engaging and supporting the work during rotation, said means comprising a pair of centers, means yieldingly urging the centers toward one another into engagement with the work, means supporting the centers and yielding means, means for actuating the said centers and yielding means axially of the grinding throat to place a work piece on and remove same from the peripheral support, means limiting the insertion of the work to control the final size thereof, and means co-operating with the yielding urge of the centers to automatically separate same upon complete withdrawal of the work piece from the grinding throat.

6. In a device of the class described for grinding a formed work piece, the combination of opposed grinding and regulating wheels having active faces of prescribed taper for respectively forming and controlling the rotation of the work piece, means terminally engaging said work piece for rotation about a predetermined axis, means yieldingly urging the terminal engaging means toward one another, and positive means for separating the terminal engaging means against the yielding resistance of the yielding means.

7. In a centerless grinder the combination of opposed grinding and regulating wheels having spaced active inclined faces forming a grinding throat of predetermined size and form, means peripherally and terminally supporting a work piece within the throat during grinding, and means relatively axially shifting the work piece terminal support and the grinding throat to reduce said work to the size and form of the grinding throat.

8. In a centerless grinder the combination of opposed grinding and regulating wheels having spaced active inclined faces forming a grinding throat of predetermined size and form, means peripherally and terminally supporting a work piece within the throat during grinding, means relatively axially shifting the work piece terminal support and the grinding throat to reduce said work to the size and form of the grinding throat, and means releasing the work from the gripping action of the terminal engaging means.

9. In a centerless grinder the combination of opposed grinding and regulating wheels forming a grinding throat therebetween, a work rest blade within the throat, means terminally engaging a work piece during grinding for rotation about a predetermined axis, a supporting bar for the terminal engaging means, and means supporting the bar for sliding action therethrough to insert and withdraw a work piece from the grinding throat while supported by the terminal engaging means.

10. In a centerless grinder the combination of opposed grinding and regulating wheels forming a grinding throat therebetween, a work rest blade within the throat, means terminally engaging a work piece during grinding for rotation about a predetermined axis, a supporting bar for the terminal engaging means, means supporting the bar for sliding action therethrough to insert and withdraw a work piece from the grinding throat while supported by the terminal engaging means, and means limiting the shifting action of the support bar to control the size and form of the work piece.

11. In a centerless grinder the combination of a pair of opposed grinding and regulating wheels forming a grinding throat therebetween, a work rest blade in said throat, and means for supporting a work piece and axially shifting said work piece relative to the throat to place said work piece on the work rest blade comprising a pair of centers, means gripping the work between the centers, a support bar for the centers and gripping means, a bracket slidably supporting the bar for movement relative thereto, and means for limiting the movement of the bar and work carried thereby to determine the final size and form of the work.

12. In a centerless grinder the combination of a pair of opposed grinding and regulating wheels forming a grinding throat therebetween, a work rest blade in said throat, and means for supporting a work piece and axially shifting said work piece relative to the throat to place said work piece on the work rest blade comprising a pair of centers, means gripping the work between the centers, a support bar for the centers and gripping means, a bracket slidably supporting the bar for movement relative thereto, and means for limiting the movement of the bar and work carried thereby to determine the final size and form of the work, means supported by the bar for actuation thereof.

13. In a centerless grinder the combination of a pair of opposed grinding and regulating wheels forming a grinding throat therebetween, a work rest blade in said throat, and means for supporting a work piece and axially shifting said work piece relative to the throat to place said work piece on the work rest blade comprising a pair of centers, means gripping the work between the centers, a support bar for the centers and gripping means, a bracket slidably supporting the bar for movement relative thereto, means for limiting the movement of the bar and work carried thereby to determine the final size and form of the work, means supported by the bar for actuation thereof, and means guiding the bracket for lateral adjustment relative to the throat to align the bar with the throat.

14. In a centerless grinder the combination of a pair of opposed grinding and regulating wheels forming a grinding throat therebetween, a work rest blade in said throat, and means for supporting a work piece and axially shifting said work piece relative to the throat to place said work piece on the work rest blade comprising a pair of centers, means gripping the work between the centers, a support bar for the centers and gripping means, a bracket slidably supporting the bar for movement relative thereto, means for limiting the movement of the bar and work carried thereby to determine the final size and form of the work, means supported by the bar for actuation thereof, means guiding the bracket for lateral adjustment relative to the throat to align the bar with the throat, and a flange on the bracket cooperating with the centers' gripping means for disengaging the work from the centers upon retraction of the bar.

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