Dec. 14, 1926. 1,610,768

A. W. GRAHAM

WORK ROTATING ATTACHMENT FOR GRINDING MACHINES

Filed April 20, 1923 3 Sheets-Sheet 1

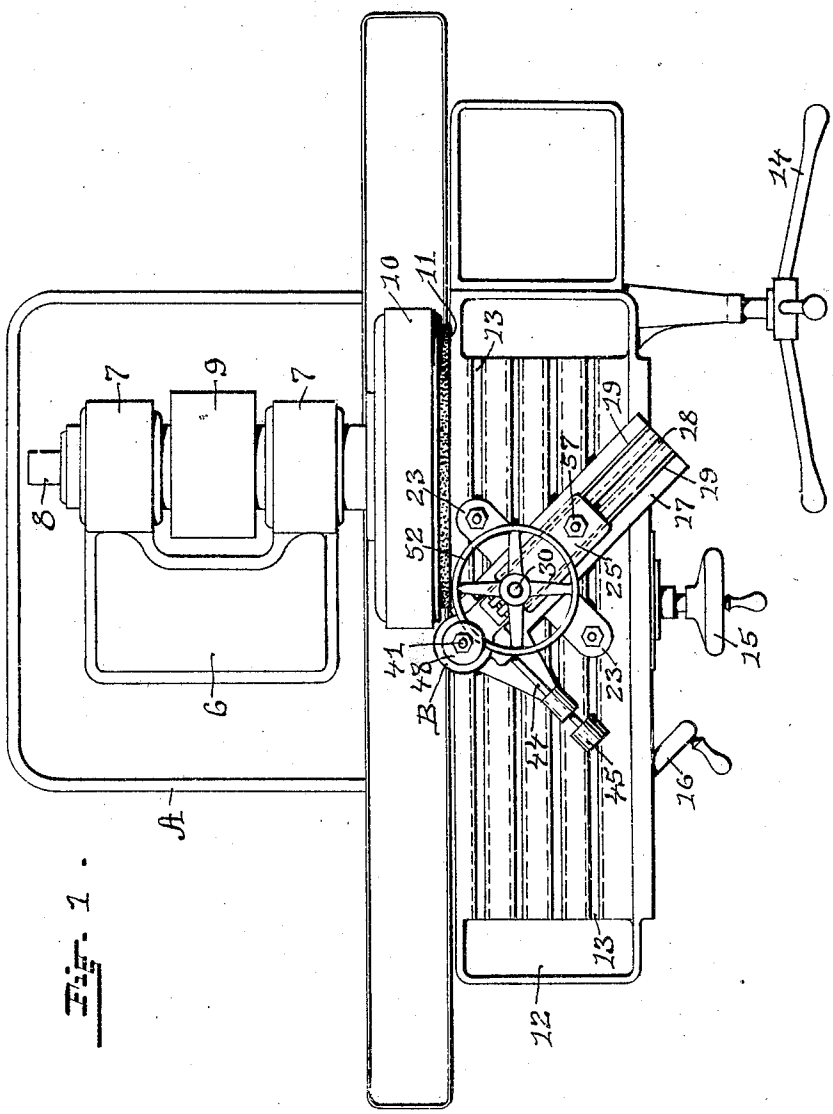


Fig. 1.

INVENTOR:

Arthur Wallace Graham

By Chas. H. Luther

ATTORNEY.

Dec. 14, 1926. 1,610,768

A. W. GRAHAM

WORK ROTATING ATTACHMENT FOR GRINDING MACHINES

Filed April 20, 1923 3 Sheets-Sheet 2

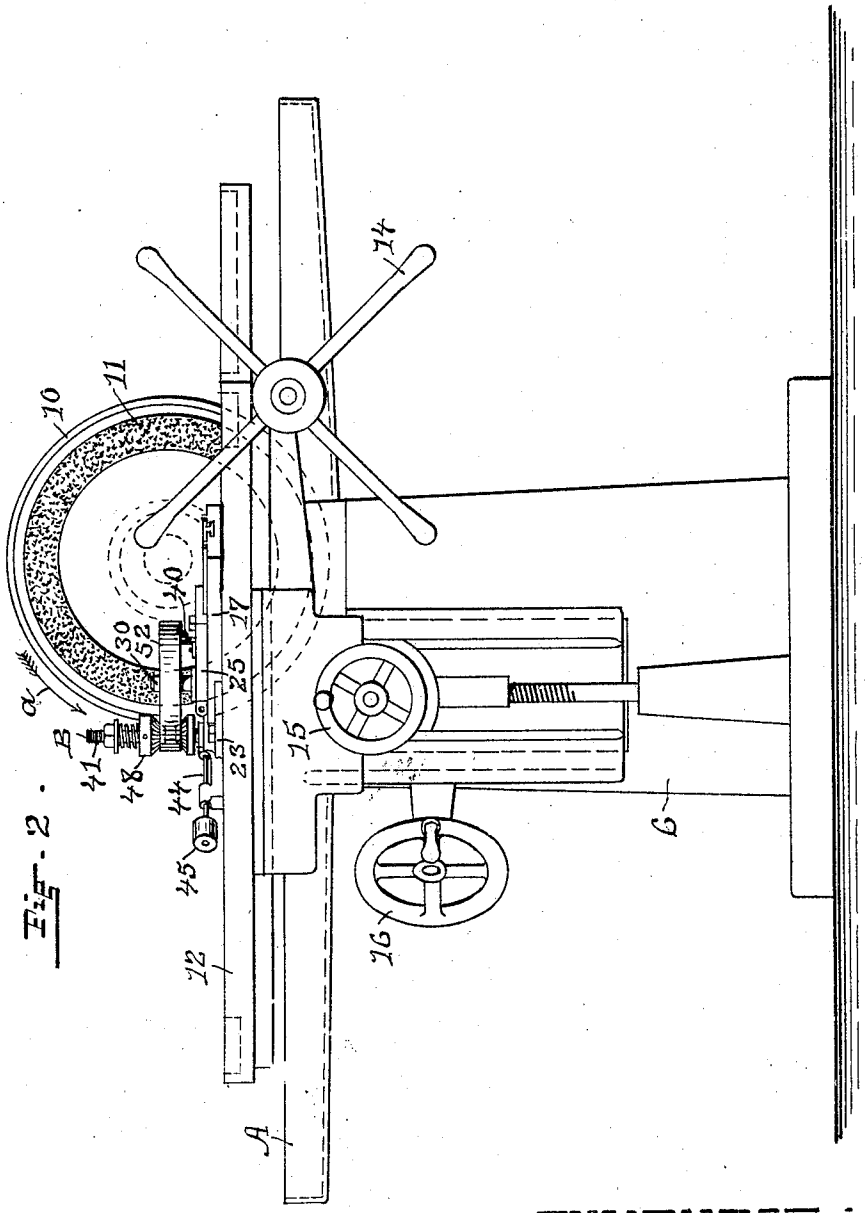


Fig. 2.

INVENTOR:
Arthur Wallace Graham
By Chas. A. Luther
ATTORNEY.

Dec. 14, 1926. 1,610,768

A. W. GRAHAM.

WORK ROTATING ATTACHMENT FOR GRINDING MACHINES

Filed April 20, 1923 3 Sheets-Sheet 3

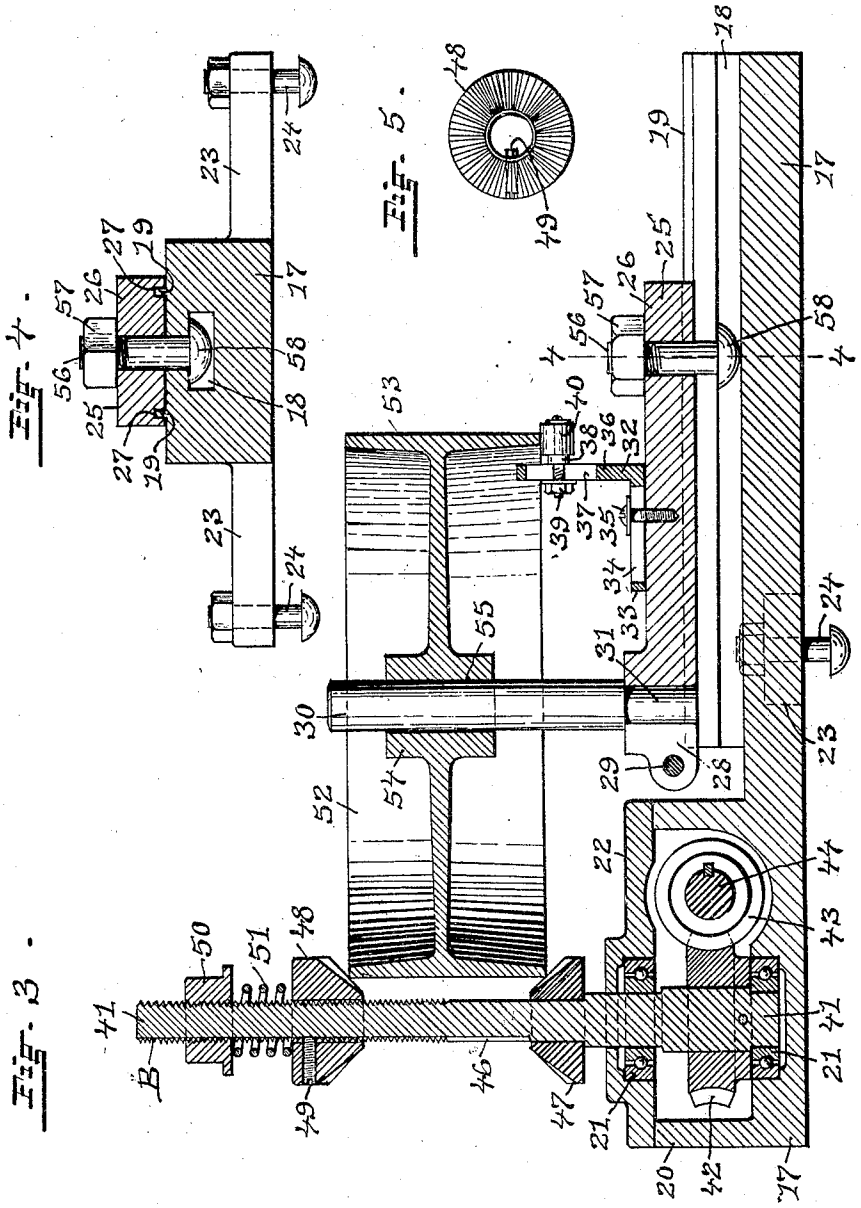


Fig. 3.

Fig. 4.

Fig. 5.

INVENTOR:
Arthur Wallace Graham
by Chas. H. Luther
ATTORNEY.

Patented Dec. 14, 1926. 1,610,768

UNITED STATES PATENT OFFICE.

ARTHUR WALLACE GRAHAM, OF PROVIDENCE, RHODE ISLAND.

WORK-ROTATING ATTACHMENT FOR GRINDING MACHINES.

Application filed April 20, 1923. Serial No. 633,422.

This invention relates to improvements in work rotating devices for grinding and similar machines, and has for one of its objects the even, precise and uniform advancing of the work.

Another object is the effective supporting of the work during rotation thereof.

A further object is the rotation of the work regardless of variation in size thereof and also regardless of the character of action upon the work.

A more detail object is the advancing of the peripheral surface of a pulley, wheel, or like work, to the place of engagement of the working instrumentalities by work-rotating means engaging the edge of the work and thereby acting in the rotating operation independently of changing or varying contours of the peripheral surface of the work.

A more detail object is the provision of cooperatively adjustable means for rotating work of variable sizes and proportions.

With these and further objects in view, as will in part hereinafter become apparent and in part be stated, the invention comprises certain novel constructions, combinations and arrangements of parts as subsequently specified and claimed.

In the accompanying drawings,—

Figure 1 is a plan view of a complete grinding machine to which has been applied an embodiment of the present invention.

Figure 2 is a front view of the parts seen in Figure 1.

Figure 3 is an enlarged, vertical, longitudinal, sectional view taken through the improved rotating attachment detached.

Figure 4 is a transverse, vertical section taken on the plane indicated by line 4—4 of Figure 3.

Figure 5 is a detail, inverted, plan view of the upper rotating cone detached.

In the accompanying drawings, A indicates generally a well known form of grinding machine, and B is employed as a general reference for the improved rotating mechanism.

The grinding machine A is illustrated especially to more completely and accurately disclose the operation and cooperation of the rotating mechanism, and may be of any ordinary make. As illustrated, it is provided with the usual supporting column 6 sustaining the journal bearings 7, 7. A shaft 8 is journaled in the bearings 7, and is provided with the usual power-receiving pulley 9, and carries at one end a grinding ring retaining chuck 10. Sustained by the chuck 10 is the usual abrading ring 11, which is adapted to be rotated in the direction indicated by the arrow *a*, as seen in Figure 2. A work table 12 of usual construction and arrangement is mounted to reciprocate on supporting guideways sustained by the column 6, and the table is provided with the usual undercut slots 13, 13. The table is adapted to be shifted endwise by gearing, not shown, but actuated by the usual pilot wheel 14. The table may also be shifted laterally in the usual manner by apparatus, not shown, operated by a hand wheel 15, and may be raised and lowered by gearing, also not illustrated, but actuated by a hand wheel 16.

The table 12 constitutes the means for feeding the work relative to the abrader 11, and the work rotating attachment B is shifted or "fed" bodily relative to the abrader. The attachment B is formed with a base 17 having laterally outstanding arms 23, 23, provided with anchoring bolts 24, 24, depending into and adjustable along the grooves 13 of the table 12.

Slidingly mounted on the base 17 is the work carrier 25 consisting of the slide 26 and its connections. Base 17 is formed with a longitudinal, central undercut groove 18. The upper face of the base 17 is provided with tracks 19 arranged at the sides of and paralleling groove 18. Slide 26 is formed with longitudinal grooves 27, 27, receiving the tracks 19. Said slide is also provided with a bolt 56 having a nut 57. Bolt 56 depends into the groove 18, and has its head 58 lying within the enlarged portion of the groove so as to enable the slide 26 to be clamped to the base 17 by the action of the nut 57 at any point of adjustment desired. A split ring 28 is formed at the inner end of slide 26 and has its free end portions connected by a cross clamping bolt 29 for detachably and firmly clamping the lower end of an upstanding arbor 30. Arbor 30 will be held by chuck 28 in the position required (usually vertical) for the proper location of the work relative to the abrading ring. Arbors of varying sizes may be substituted, and each is preferably provided with a reduced lower end portion 31 which fits in and is adapted to be clamped by the ring 28. An L-shaped bracket 32 is slidingly mounted on the upper face of the slide 26 and arranged with a horizontal arm 33 and a vertical arm

36, the former being slotted longitudinally at 34, and the latter similarly slotted at 37. A bolt 35, extending through slot 34 and threaded into the slide 26, is adapted to clamp and retain the bracket 32 in any position of horizontal adjustment. A stud 38, having a screw-threaded inner end portion, extends through the slot 37 and is engaged by a nut 39 for clamping the stud at any of various points of vertical adjustment. A roller 40, with a horizontal periphery and axis, is mounted on the stud 38 to support the edge of the work, as hereinafter stated.

One end portion of base 17 is formed into a housing 20 having a cap or cover plate 22 anchored to the housing in any appropriate manner, not illustrated. Within the housing are arranged the anti-friction bearings 21. 21, which engage and sustain in position the upstanding shaft 41, which extends upwardly beyond the housing to carry the work-rotating devices, hereinafter mentioned. A worm gear 42 is fixed to the lower portion of shaft 41, preferably within housing 20, and meshes with a worm 43 carried and actuated by the drive shaft 44 journaled in the side walls of the housing 20, and extending at one side beyond said housing. The extended portion of the shaft 44 is provided with a power-receiving pulley 45. The outer portion of the shaft 44 is also preferably sustained in a journal bearing upstanding from a lateral extension of the base 17, as clearly seen in Figures 1 and 2.

The shaft 41 is formed with a spline groove 46, and also has its upper portion threaded. Mounted on shaft 41 are work-rotating members, preferably in the form of spaced friction cones 47 and 48. The cone 47 is fixed on the shaft 41, as by having a driving fit thereon. The cone 48 is mounted to rotate with and slide longitudinally of the shaft 41, as by having a set screw 49 entering the groove 46 for rotatively driving the cone 48 with the shaft 41, while leaving said cone 48 free to slide longitudinally of the shaft. A nut 50 is threaded onto the upper portion of shaft 41, above cone 48, and a spring 51 is coiled about the shaft 41 and interposed between the nut 50 and the cone 48 for stressing the latter downward. The tapering faces of the cones 47 and 48 are presented toward each other, that is to say, cone 47 faces upward while cone 48 faces downward, and each of said faces is preferably provided with serrations or similar means for increasing its friction. As shown, such serrations preferably consist of inverted V-shaped ribs.

While the present improved device is susceptible of use in conjunction with various kinds of work, it is especially well adapted for utilization in conjunction with the finishing of pulleys, and for that reason there is illustrated in the drawings a pulley located in operative position. As best seen in Figure 3, the work or pulley shown at 52, having the usual hub 54 penetrated by the usual axial bore 55, is mounted with its hub surrounding the spindle 30, and with the lower edge of the rim resting at one point on cone 47 and at another point on the roller 40. Under some conditions, roller 40 is removed and pulley 52 is supported by its edge contact with cone 47 and its hub engagement with spindle 30. The roller 40 is located diametrically opposite cone 47 with respect to the pulley 52, and is adapted for adjustment laterally relative to arbor 30 for accommodating variation in diameter of different pieces of work. For different widths of different pieces of work which engage the inclined face of cone 47 at different heights, the roller is adjustable vertically, that is, in the direction of the length of the arbor 30.

For most work, the engagement thus effected with cone 47, with or without roller 40, is ample for purposes of rotating the pulley 52, and thus rotating it relative to the abrading ring or other operating devices; but to increase the force of the friction drive against the pulley 52, the cone 48 is provided and arranged, as seen in Figure 3, with its tapering face engaging the upper edge of the pulley 52 directly above the point of engagement of the lower edge of said pulley with the cone 47. The stress of the spring 51 adds the pressure of the spring tension to the frictional engagement both of cone 48 with pulley 52 and of cone 47 therewith.

The parts being in the position just stated, the operation is carried out by first locating the base 17 on table 12 at the point desired for bringing the pulley 52 into that relationship with the abrading ring 11 for causing the ring 11 to act on the peripheral surface 53 of pulley 52 in the manner desired. For instance, the ring 11 is so constructed that, when the central portion thereof strikes across the surface 53 of pulley 52, as when the parts are in the position shown in Figures 1 and 2, that surface will be finished as a straight cylinder; but if the pulley be shifted inward relative to ring 11, so that the inner edge of the ring 11 acts upon the face of the pulley, said face will be ground convex or crowned; whereas if the pulley is shifted outward to the outer edge of the abrading ring 11, the face of the pulley will be finished off with a concaved surface. It is understood, of course, that the table 12 is shifted to bring the pulley 52 into its operative relation to the ring 11.

It will be observed that notwithstanding the character of work performed by the ring 11 on the pulley 52, the rotating action of the cones 47 and 48 will be the same, it being obvious that, when the shaft 44 is revolved by any appropriate driving connection, the shaft 41 will be rotated and the pulley 52

revolved under the frictional engagement of the cones. Thus a steady, uniform, effective rotation of the work is accomplished and precision and ease of action are insured.

While, in conformity with the statute, there is presented in the drawings and described in detail above the preferred embodiment of the invention in the sense that complete details are included, it is nevertheless true that a very desirable and commercially successful embodiment omits the roller 40 and its adjustable bracket support, and also omits the upper driving cone 48, and the extended portion of shaft 41 for carrying the upper cone. Thus a thoroughly successful machine has been found to involve simply a support for arbor 30, together with such arbor, and the work, supporting and rotating cone 47 with its actuating parts. Furthermore, the functioning of cone 47 as a support for the work as well as a rotator is important, and, in fact, in most instances the cone 47 forms the sole support of the work save only for the supporting component of transverse-axial stresses of the work against the arbor 30, which in all pulleys and like work having hubs of any appreciable length is ample to eliminate any need for the idler 40, which idler is employed only to prevent canting of the work when no hub or an extremely short hub is presented on the work. Arbor 30 may, therefore, be considered a support for the work cooperating with the rotating cone 47 as truly as may idler 40. The appended claims should, therefore, be interpreted in the light of this admittedly, extremely desirable and commercially successful embodiment of the invention as well as and in contra-distinction to the said preferred embodiment.

While the details of the preferred embodiment of this invention have been carefully set forth, it is apparent that various changes in the size, number, proportion, and arrangements of the parts, and in their gearing and operation, may be made without the slightest departure from the invention, and all such changes are intended to be covered and included in the scope of the appended claims.

What is claimed is:—

1. The combination, with an abrader, of a work support adapted to sustain work in position for free rotation and free movement along the line of the axis of such rotation, and a rotator for the work mounted to engage and sustain a portion of the work for frictionally advancing the work about its axis.

2. In work rotating attachments for abraders, the combination of a support for work adapted to have the work supported in horizontal planes and free to rotate about a vertical axis thereon and also free to move upward, a rotator spaced laterally horizontally from the support in position for engaging and supporting an edge portion of the work, and means for actuating the rotator for advancing the work about its vertical axis by such edge engagement.

3. In work rotating attachments for abrading machines, the combination of a support for work adapted to have the work supported in horizontal planes and free to rotate about a vertical axis and also free to move upward, an upwardly facing cone spaced laterally from the support and located with its tapering face exposed upward in position for extending across and supporting an outstanding portion of the work.

4. In pulley rotating attachments for abrading machines, the combination of an upstanding arbor adapted to receive the hub of a pulley to be abraded and for sustaining the same rotatably and allowing it to have free upward movement, a rotating cone spaced laterally horizontally of the arbor sufficiently to have its tapering face positioned to extend across and engage and support at substantially one point only the circular edge of the rim of a pulley engaging the arbor, and means for rotating the cone.

5. In pulley rotating attachments for abrading machines, the combination of means for rotatably sustaining a pulley to be abraded, said sustaining means leaving the pulley free for upward movement, a vertically disposed shaft spaced laterally horizontally of the pulley support in position to extend past and adjacent to the periphery of a pulley mounted on said support, cones carried by the shaft in position to engage and extend across the lines of the circular edges of the rim of the pulley, one of the cones being fixed to the shaft and adapted to sustain the weight of the engaged portion of the pulley, and means for rotating the shaft.

6. In work-rotating attachments for abrading machines, the combination of an upstanding arbor, a shaft spaced laterally therefrom, supports for the shaft and arbor, one of said supports being movable relative to the other for varying the space between the shaft and arbor, the arbor being adapted to receive work and leave the same free for rotation and axial shifting, a driving cone carried by the shaft and adapted to be actuated thereby while in a position under and sustaining the weight of the work mounted on the arbor, and means for driving the shaft.

7. In work-rotating attachments, the combination, with a work support adapted to sustain work in horizontal planes, of a rotating cone having its inclined face disposed to frictionally engage and support otherwise unsupported outer portions of the work, and means for rotating the cone for

rotating the work incident to said engagement.

8. In work-rotating attachments, the combination, with a work support adapted to sustain work in horizontal planes, of a cone mounted to rotate about a vertical axis and having its tapering face exposed upwardly and disposed to frictionally engage and support otherwise unsupported outer portions of the work, and means for rotating the cone for rotating the work incident to said engagement.

9. In work-rotating attachments, the combination with a support adapted to sustain circular work in horizontal planes, of a cone located to engage at one point only the otherwise unsupported periphery of the work for supporting the work, and means for driving the cone for rotating the work incident to said engagement.

10. In work-rotating attachments, the combination, with work supporting means adapted to sustain work in horizontal planes, of a friction rotator for the work located to engage and support otherwise unsupported portions of the work, the rotator being located and proportioned to engage the work along substantially a single line of contact, the rotator extending across said line and intersecting horizontal planes above and below said line, and means for actuating the rotator for rotating the work incident to said engagement.

11. In work-rotating attachments, the combination of an arbor adapted to rotatably sustain work, a support for the peripheral portion of work engaging the arbor, and a conical friction drive spaced from said peripheral support and located to engage the peripheral portion of such work, the arbor and peripheral support being adjustable relative to the drive, and the peripheral support being adjustable both laterally of the arbor and longitudinally thereof.

In testimony whereof, I have signed my name to this specification.

ARTHUR WALLACE GRAHAM.