No. 888,496. PATENTED MAY 26, 1908.

J. N. HEALD.

FEEDING MECHANISM FOR GRINDING MACHINES.

APPLICATION FILED MAY 9, 1906.

2 SHEETS—SHEET 1.

Fig.1.

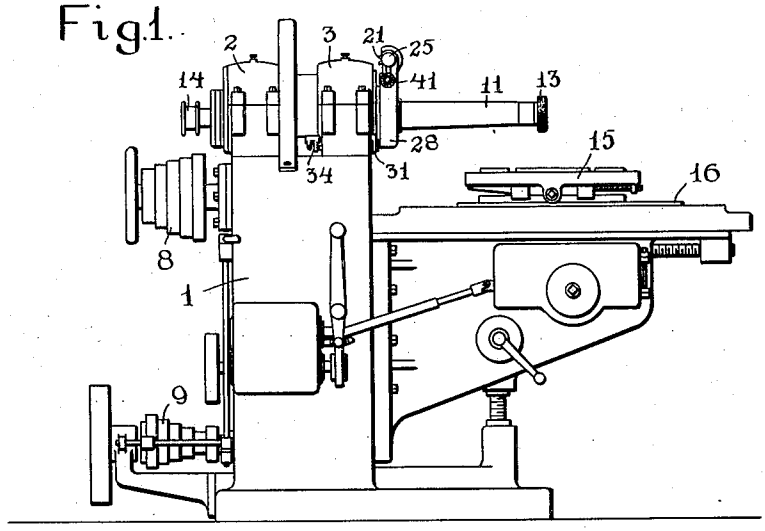


Fig.2.

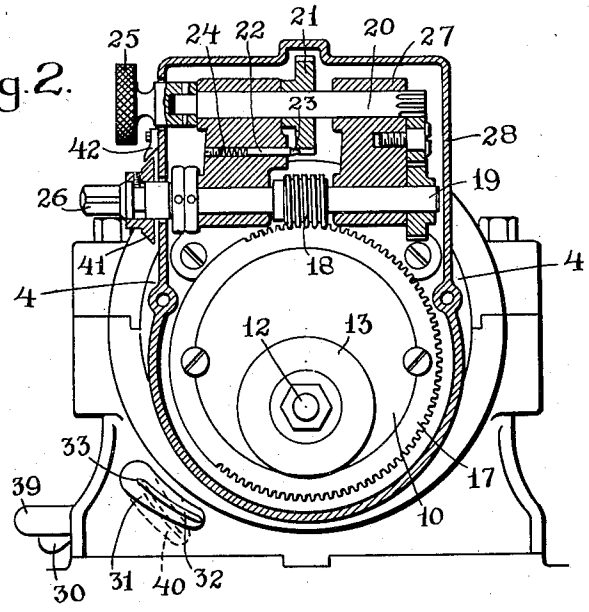
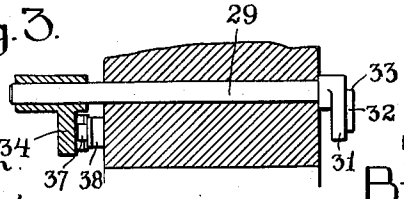


Fig.3.



Witnesses

Roy D. Tolman.

Penelope Comberbach.

Inventor

James N. Heald.

By Rufus B. Fowler

Attorney

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2 SHEETS—SHEET 2.

Fig. 4.

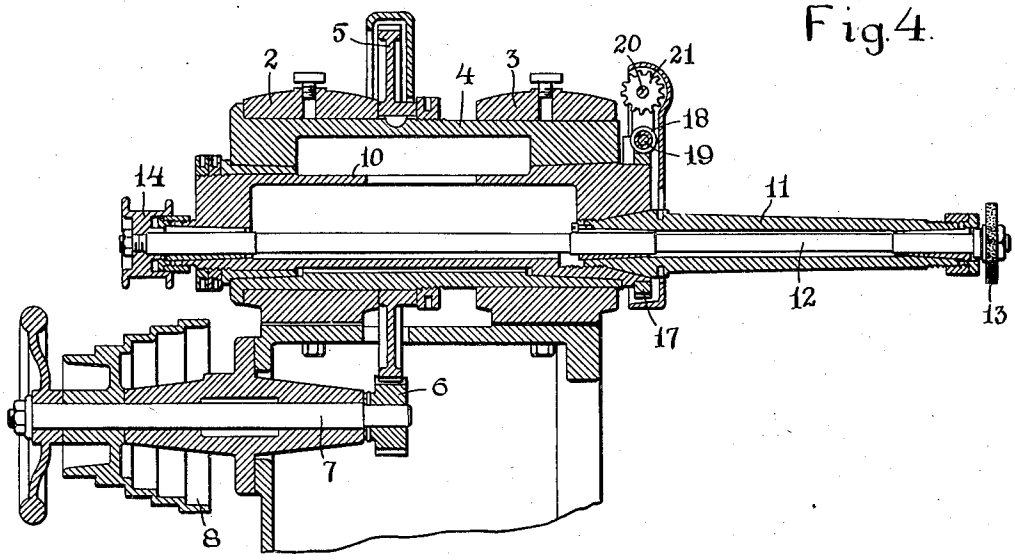
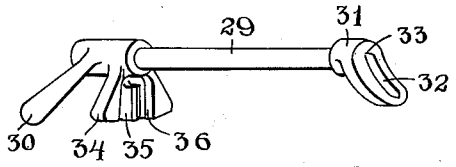


Fig. 5.



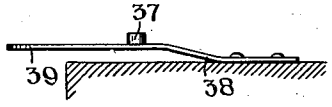


Fig. 6.

Witnesses

Roy D. Tolman.

Penelope Comberbach.

Inventor

James N. Heald.

By Rufus B. Fowler

Attorney

UNITED STATES PATENT OFFICE.

JAMES N. HEALD, OF WORCESTER, MASSACHUSETTS, ASSIGNOR TO THE HEALD MACHINE COMPANY, OF WORCESTER, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS.

FEEDING MECHANISM FOR GRINDING-MACHINES.

No. 888,496. Specification of Letters Patent. Patented May 26, 1908.

Application filed May 9, 1906. Serial No. 315,885.

To all whom it may concern:

Be it known that I, JAMES N. HEALD, a citizen of the United States, residing at Worcester, in the county of Worcester and Commonwealth of Massachusetts, have invented a new and useful Improvement in a Feeding Mechanism for Grinding-Machines, of which the following is a specification, accompanied by drawings forming a part of the same, in which—

Figure 1 is a front elevation of a grinding machine embodying my invention. Fig. 2 is a sectional view on line 2—2, Fig. 1, through the feeding mechanism for advancing the grinding wheel to the work. Fig. 3 is a detached and sectional view of a portion of the feeding mechanism. Fig. 4 is a longitudinal sectional central view through the head of the machine. Fig. 5 is a detached isometric view of the device for actuating the star wheel of the feeding mechanism, and Fig. 6 is a top view of the blade spring for reversing the sliding spindle 29.

Similar reference letters and figures refer to similar parts in the different views.

My present invention relates to a feeding mechanism for that class of grinding machines designed for grinding internal cylindrical surfaces, in which a revolving grinding wheel is given an orbital movement around a fixed center, whereby the periphery of the grinding wheel is moved around the surface of the work instead of revolving the work around a grinding wheel which revolves about a fixed axis. Grinding machines of this type are especially adapted to a great variety of work in which it is inconvenient to revolve the work about the grinding wheel.

In grinding machines of this class the grinding wheel is carried upon a rapidly revolving arbor journaled eccentrically in a sleeve held in a rotating cylinder, journaled in the head of the machine. As the cylinder is rotated the spindle of the grinding wheel is carried around in a circular path whose diameter is determined by the eccentricity of the axis of the spindle to the axis of the rotating cylinder. The eccentric sleeve carrying the grinding wheel spindle is provided with a feeding mechanism by which it may be rotated within the cylinder, in order to vary the eccentricity of the grinding wheel spindle relatively to the rotating cylinder and thereby increase or diminish the diameter of the circular path through which the axis of the grinding wheel spindle moves as the cylinder is rotated.

By means of the feeding mechanism the circular path or orbital movement of the grinding wheel can be varied to adapt the grinding wheel to the internal diameter of the surface to be ground, and when the operation of the grinding is in progress the feeding mechanism enables the grinding wheel to be moved outward to compensate for the wear of the wheel, and to bring the ground surface to the desired diameter.

My present invention relates to the feeding mechanism by which the eccentricity of the grinding wheel is varied relatively to the rotating cylinder and it has for its object to enable the operator to quickly change the eccentricity of the grinding wheel; to secure an accurate adjustment of the grinding wheel, and to facilitate the grinding of duplicate work, and these objects I accomplish by means of the construction and arrangement of parts as hereinafter described and pointed out in the annexed claims.

Referring to the accompanying drawings, 1 denotes the supporting framework of a grinding machine, upon which are mounted bearings 2 and 3 for a rotating cylinder 4, carrying a gear wheel 5 which is engaged by a pinion 6 upon a shaft 7, carrying a step pulley 8 which is driven from a pulley 9 on a countershaft at the base of the machine. Journaled eccentrically in the cylinder 4 is a sleeve 10, provided at one end with a tubular extension 11, and in the sleeve 10 and extension 11 is journaled a revolving spindle 12, carrying on one end a grinding wheel 13 and at the opposite end a belt pulley 14.

The work to be ground is supported upon a table 15 on a bed 16 to which a traversing motion is given by means of suitable mechanism, such as is commonly used in machines of this class to impart a traversing motion to the work. The grinding wheel 13 is inserted within the work to be ground and is rapidly rotated by the belt pulley 14, while a slow orbital movement is given to the grinding wheel by the rotation of the cylinder 4. The sleeve 10 is capable of being turned within the cylinder 4 in order to vary the eccentricity of the spindle 12 to the axis of the cylinder 4, and this adjustment of the sleeve 10 is accomplished by a feeding mechanism which embodies my present invention.

Attached to the sleeve 10 is a worm gear 17

engaged by a worm 18 on a shaft 19, having a geared connection with a parallel shaft 20 which carries a star wheel 21, which is frictionally held from accidental turning by means of a sliding spindle 22 held in the framework, and having its outer and beveled end 23 pushed between the teeth of the star wheel by a spring 24. The shaft 20 is provided with a knurled hand wheel 25 and the shaft 19 is provided with a squared end 26 to receive a wrench. The shafts 19 and 20 are journaled within a framework 27 and inclosed within a casing 28, both of which are attached to the rotating cylinder 4, causing the feeding mechanism to be carried around by the cylinder 4. Held in the framework of the machine is a spindle 29 capable of a rocking and a longitudinal movement. One end of the spindle carries a lever handle 30 and the opposite end carries a radial arm 31, on the outer face of which projects a longitudinal rib 32, one end 33 of said rib being substantially coincident with the axis of the rocking spindle 29. The lever handle 30 is provided with a radial projecting wing 34, having two recesses 35 and 36 adapted to alternately receive the end of a pin 37 carried by a blade spring 38, attached at one end to the framework of the machine, and having its opposite end 39 projecting beyond the framework to form a convenient handle to enable the pin 37 to be retracted.

The tension of the spring 38 not only locks the spindle 29 against rotation, but also holds the radial arm 31 against the framework, with the projecting rib 32 normally out of the path of the star wheel 21 as the latter is carried around the axis of the cylinder 4. By lifting the pin 37 out of engagement with the wing 34, the spindle 29 may be slightly rocked so as to bring the pin into the other notch and vary the position of the radial arm 31, from the position shown in full lines in Fig. 2 to that shown by broken lines 40, for the purpose of reversing the movement of the feeding mechanism.

In the position of the radial arm 31 as shown in Figs. 2 and 5, the projecting rib 32 is slightly eccentric to the axis of the rotating cylinder 4, sufficiently to cause the star wheel to be turned the space of one tooth as it passes the rib 32, causing a slight movement of the sleeve 10 to increase the eccentricity of the spindle 12 to the axis of the rotating cylinder 4, thereby carrying the grinding wheel slightly outward. The projection 32 is brought into the path of the star wheel by the operator moving the spindle 29 longitudinally against the tension of the blade spring 38 by means of the lever handle 30, and holding it in position until the star wheel passes by the projection 32. Each passage of the star wheel by the projecting rib 32 is arranged to carry the periphery of the grinding wheel outward about .00025 of an inch. When the first piece of work has been accurately ground, as may be determined by calipering, the eccentricity of the grinding wheel spindle 12 is determined by means of a graduated index disk 41, frictionally held on the shaft 19 and capable of being turned under the fixed index point 42. When the grinding is completed the index disk 41 is set at zero. The grinding wheel is then moved toward the center of the rotating cylinder 4 to be inserted in the succeeding piece of work and the grinding of the second piece may be continued without interruption for calipering until the index disk returns to zero. The interior surface ground will then be of the correct size, varying only a slight amount due to the wear of the wheel while grinding.

The squared end 26 of the shaft 19 enables a quick feeding movement to be imparted to the grinding wheel by means of a wrench handle, and a fine adjustment of the grinding wheel may be obtained independently of the projecting rib 32 by means of the hand wheel 25.

I claim,

1. In a grinding machine of the class described, the combination of a rotating cylinder, a revolving grinding wheel spindle journaled eccentrically within said rotating cylinder, a star wheel carried in a circular path by said cylinder, a projection held in the fixed framework of the machine in the path of said star wheel, whereby an intermittent motion is given to said star wheel at each rotation of said cylinder, and a feeding mechanism operatively connected with said star wheel for varying the eccentricity of said grinding wheel spindle.

2. In a grinding machine of the class described, a feeding mechanism for varying the orbital path of the grinding wheel, consisting of a rotating star wheel carried in a circular path concentric with the orbital path of the grinding wheel spindle, means for operatively connecting said star wheel and said grinding wheel spindle, and means for imparting an intermittent motion at will to said star wheel during its concentric movement.

3. In a grinding machine of the class described, a feeding mechanism for varying the orbital path of the grinding wheel spindle, comprising a star wheel having a circular movement around a fixed axis, and a projection held in the framework of the machine capable of being moved at will into the path of said star wheel.

4. In a grinding machine of the class described, a rotating member for carrying the grinding wheel spindle in an orbital path concentric with the axis of said rotating member, means for varying the eccentricity of the grinding wheel spindle relatively to said rotating member, comprising a star wheel carried by the rotating member, and a projection held in the framework of the machine

capable of being moved into and out of the path of said star wheel.

5. In a grinding machine of the class described, a feeding mechanism for varying the orbital movement of the grinding wheel spindle, and comprising a star wheel carried in a circular path corresponding with the orbital movement of the grinding wheel spindle, a projecting rib supported by the framework of the machine, and means for bringing said rib at will into position to engage the teeth of said star wheel.

6. In a grinding machine of the class described, a rotating cylinder carrying the grinding wheel spindle, a feeding mechanism for varying the orbital path of the grinding wheel spindle, and comprising a star wheel, said feeding mechanism being carried in a circular path by said rotating cylinder, a spindle journaled in the framework of the machine, a radial arm carried by said spindle, a projecting rib on said arm arranged to engage the teeth of said star wheel, means for rocking said spindle, and means for locking said spindle.

7. In a grinding machine of the class described, a rotating cylinder carrying a grinding wheel spindle, a feeding mechanism carried by said cylinder and comprising a star wheel, a projecting rib arranged to engage the teeth of said star wheel as said cylinder rotates, and means for changing the position of said rib in order to reverse the movement of the star wheel.

8. In a grinding machine of the class described, a rotating cylinder, a grinding wheel spindle carried by said cylinder, a feeding mechanism carried by said cylinder for varying the orbital path of said grinding wheel spindle, and comprising a star wheel, a spindle held in the framework and capable of a longitudinal movement therein, a radial arm held on said spindle, a projecting rib on said arm, means for sliding said spindle to bring said projecting rib into the path of said star wheel, and a spring for reversing the motion of said spindle.

9. In a grinding machine of the class described, the combination of a rotating cylinder, a sleeve journaled eccentrically in said cylinder, a grinding wheel spindle journaled eccentrically in said sleeve, a framework carried by said cylinder, a feeding mechanism carried by said framework operatively connected with said sleeve, and comprising a star wheel carried by said framework in a circular path concentric with the path of the grinding wheel spindle, a projection held in the fixed framework of the machine in the path of said star wheel, a graduated disk capable of being rotated by said feeding mechanism and a fixed index finger.

Dated this first day of May 1906.

JAMES N. HEALD.

Witnesses:
RUFUS B. FOWLER,
PENELOPE COMBERBACH.