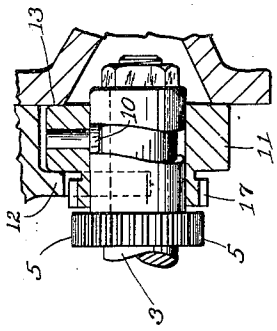
March 15, 1932. S. EINSTEIN 1,849,868

GRINDER WHEEL OSCILLATOR

Filed Nov. 8, 1923 2 Sheets-Sheet 1

Fig. 2.



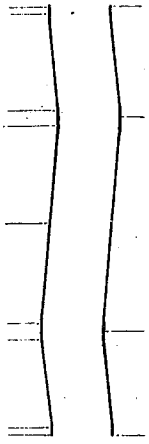


Fig. 3.

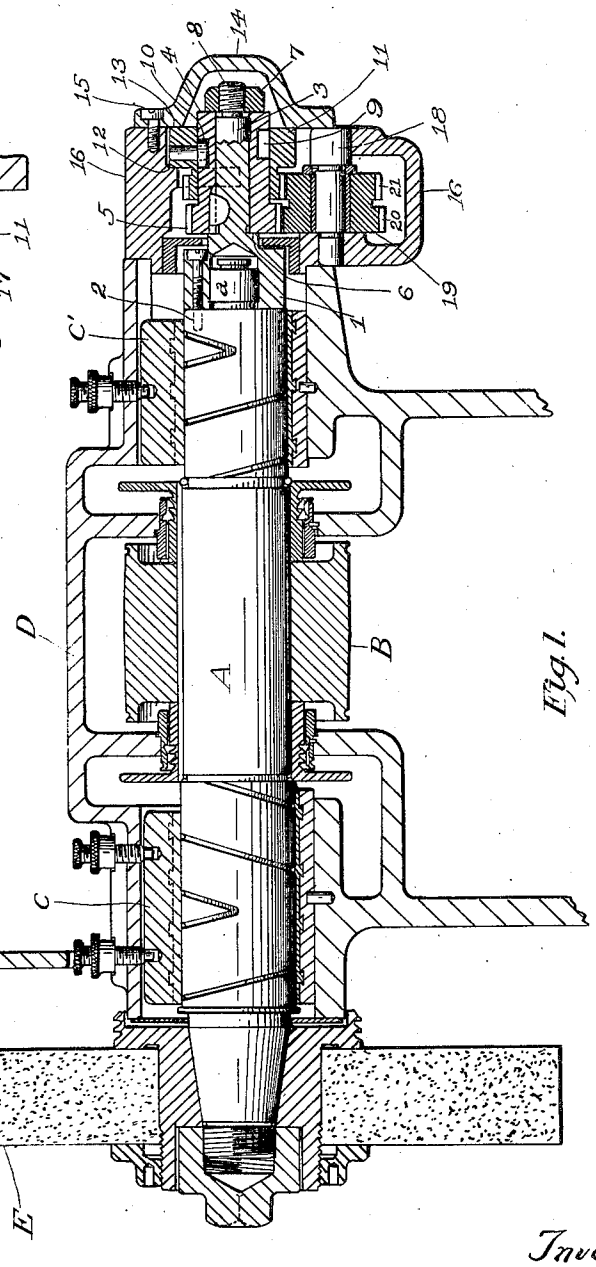


Fig. 1.

Inventor
Sol Einstein
By Attorney
Albert F. Nathan

March 15, 1932. S. EINSTEIN 1,849,868

GRINDER WHEEL OSCILLATOR

Filed Nov. 8, 1923 2 Sheets-Sheet 2

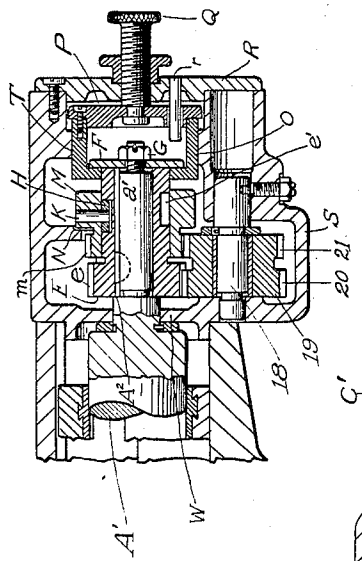


Fig. 5.

Fig. 4.

Inventor
Sol Einstein
By Attorney
Albert F. Nathan

Patented Mar. 15, 1932 1,849,868

UNITED STATES PATENT OFFICE

SOL EINSTEIN, OF CINCINNATI, OHIO, ASSIGNOR TO THE CINCINNATI MILLING MACHINE COMPANY, OF CINCINNATI, OHIO, A CORPORATION OF OHIO

GRINDER WHEEL OSCILLATOR

Application filed November 8, 1923. Serial No. 673,547.

This invention is concerned with improvements in grinding-machines and it deals more especially with means for imparting a slight to and fro shifting of the grinding wheel, while it is continuously rotating.

In certain classes of work, as for example when truing the grinding-wheel, it is desirable that the wheel should be bodily translated in the longitudinal direction of its axis while rotating so that the periphery of the wheel may receive more perfect finish during the truing operation. It is also desirable that the means for accomplishing this oscillatory movement may readily be thrown out of action to permit the grinding-wheel to remain fixed in the same plane during its normal usage. An objective of this invention is, accordingly, to render available an oscillator so designed that it may with facility be thrown either into or out of action.

Other objects are to devise an oscillator occupying but little space and which will be self-contained and of simple construction and capable of functioning smoothly and reliably.

It is also an incidental object of this invention to so organize the oscillator that it may, with slight modifications, admit of being combined with existing spindles of grinding-wheels or built into the construction initially, as the case may be. It is also an object to devise an oscillator that may be readily affixed to the outer end bearing of a grinding-wheel spindle so as to be inconspicuous.

Other objects and advantages will be in part indicated in the following description and in part rendered apparent therefrom in connection with the annexed drawings.

To enable others skilled in the art so fully to apprehend the underlying features hereof that they may embody the same in the various ways contemplated by this invention, drawings depicting a preferred typical construction have been annexed as a part of this disclosure and, in such drawings, like characters of reference denote corresponding parts throughout all the views, of which:

Fig. 1 is a longitudinal section of a conventional grinding-wheel spindle with which the oscillator has been combined; the device in this instance being in the nature of an attachment. Fig. 2 is an enlarged detail showing the circumferential cam groove that accomplishes the oscillation. Fig. 3 is a development of the cam groove.

A modification is shown by Fig. 4 which is a longitudinal section representing a built in construction in which the spindle is initially made somewhat longer and so formed as to reduce the number of parts of the oscillator. Fig. 5 is an enlarged fragmentary section of the oscillator.

Referring to Sheet 1 of the drawings, A denotes a conventional grinding-wheel spindle which is appropriately mounted in suitable bushings C and C′ carried by the frame D. This spindle derives motion from a belt pulley B and, at its forward end, carries the grinding-wheel E. The journals of the spindle are truly cylindrical and so formed that, except for the means hereinafter to be noted, the spindle may be shifted to and fro longitudinally of its axis while rapidly rotating.

Inasmuch as the spindle must rotate very rapidly, and since the movement for oscillating it is taken from the rapidly rotating spindle, and since the oscillations must take place very slowly compared with the frequency of revolutions of the spindle, the oscillator must receive a very fast speed and must ultimately impart a very slow to and fro motion to the spindle. This invention has attained that end by employing two elements that each rotate at a very high rate but at a slow rate relatively to one another and it is the differential rate that is utilized for oscillating the spindle. These two elements are designated 4 and 11, respectively, on Figs. 1 and 2. In this embodiment of the invention, the element 4 has a sleeve-like form and the element 11 is ring-like and is journaled to rotate freely on the other. However, a cam and follower so connects elements 4 and 11 that, without straining their relative rotatability, a relative slide or reciprocation is caused to take place between these elements during each relative rotation thereof. This may neatly be accomplished by providing

the male element 4 with a circumferential cam-groove (shown in development by Fig. 3) and providing the female element 11 with a pin 10, or roller, that projects into and rides around the circumferential cam. Now it will be seen that if one of these elements is restrained against lateral displacement the other will necessarily reciprocate laterally whenever any relative movement exists therebetween, even while both of these elements have a very high absolute rate of rotation. The frequency of the reciprocation will depend solely upon the relative rotation between these elements and will in other respects be independent of the absolute rapidity of rotation of these elements. Thus, one of these elements may rotate as fast as the spindle and, if the other rotates almost as fast as the spindle, the one element may be utilized to slowly reciprocate the spindle providing the other is restrained against lateral displacement.

This may be very compactly done by the structure shown in Fig. 1 in which the element 4 is mounted on a stud 3 that is secured to the end of the spindle so as to form an extension thereof. A convenient way of making this attachment is by turning down the extremity of the spindle A to form a small extension *a* which snugly fits within the bore of the enlarged end 1 of the stud 3; one or more screws 2 being employed to hold the parts together. The male element 4 is splined on the stud 3 and normally is restrained against lateral movement relative to the spindle by means of a nut 7 which, however, can be removed to permit of relative sliding as will be presently described. Thus, the male element 4 is caused to rotate as a unit with the spindle at the high absolute rate of the latter. It, however, is provided with a gear 5 and the female element 11 is provided also with a gear 17; there being a small difference in the ratio of these gears as, for example, by providing the gear 17 with either one more or one less tooth than the gear 5. A gear-unit 19 is provided with two gears 20 and 21 which always mesh with gears 5 and 17, respectively; said gear-unit being mounted on a pin 18 which is supported at its ends in the housing 16 affixed in any appropriate manner to the end of the main frame D.

Since the male element 4 is thus fixed to the spindle A it is necessary to restrain the female element 11 against side play and this is done by utilizing the housing 16; the latter having a shoulder 12 bearing against one side of the female element 11. The cap 14 of the end of the housing 16 (secured thereto by screws such as 15) furnishes the other shoulder 13 and thus the female element may rotate with the male element at a slightly different rate but cannot have any side-play and its pin 10, by reason of the engagement with the cam-groove 9, will cause the male element slowly to shift to and fro in a direction longitudinal with its axis. This will consequently impart a similar movement to the spindle A while it is rapidly rotating.

To suspend the oscillation, the cover-plate 14 may be removed and either the nut 7 may be taken off or the gear-unit 19 may be removed. If the nut 7 be removed, the male element 4 will be permitted to reciprocate freely on the stub 3 and will not be able to impart its reciprocations to the spindle. Likewise, if the gear 19 be removed, the elements 4 and 11 may be locked together to rotate as a unit at the same rate of speed and hence be devoid of any relative reciprocation.

In the preferred arrangement shown by Figs. 4 and 5, the spindle A′ is initially formed with an integral extension *a′* and the male element E^1 is splined thereto and restrained against relative lateral motion by a shoulder A^2 and by a collar F held in place by a lock-nut G. The female member M is journaled, as before, on the male element E^1, and has a pin K projecting into the cam groove *e′* and the female element M is restrained against side-play by a shoulder N within the auxiliary housing S and by an adjustable shoulder O which is here in the form of a circular box adapted to be slid in the bearing T either into the position shown by Fig. 4 to prevent side-play of the female element M or into the position shown by Fig. 5 to permit such side-play. This adjustment may be accomplished by a thumb-screw Q threaded through the cover R which is affixed to the auxiliary housing S and is provided with a pin *r* to hold the adjustable shoulder O against rotation so that it will not automatically disturb the adjustment.

The gear-unit 19 is journaled on a pin 18 affixed in the auxiliary housing S and the gear *e* drives the gear 20 and the gear 21 drives the gear *m* and thus accomplishes the slight relative rotation between the male and the female elements.

In this preferred form, it will be perceived that by merely adjusting the thumb-screw Q, the mechanism may at once be set as shown by Fig. 4 to accomplish the oscillation or, as shown by Fig. 5, to restrain the oscillation. In the latter case, the female member M can reciprocate slightly and the spindle is prevented from any shifting by reason of the fact that the shoulder O now bears against the collar F and pulls the spindle until it is shouldered against the wall W; thus prohibiting any longitudinal movement thereof.

Without further analysis, the foregoing will so fully reveal the gist of this invention that others can, by applying current knowledge, readily adapt it for various utilizations by retaining one or more of the features that, from the standpoint of the prior art, fairly constitute essential characteristics of either the generic or specific aspects of this

invention and, therefore, such adaptations should be, and are intended to be, comprehended within the meaning and range of equivalency of the following claims.

Having thus revealed this invention, I claim as new and desire to secure the following combinations and elements, or equivalents thereof, by Letters Patent of the United States:

1. A grinding-machine comprising an axially shiftable spindle; a first member having a circumferential cam-groove mounted on said spindle; means for prohibiting shifting of said member relative to said spindle; a second member loosely journaled co-axial with said spindle and in directly deriving rotation therefrom so that there is relative rotation between said first and second member, said second member having a part engaging said cam-groove; a removable stop adapted to prevent reciprocation of said second member to thereby cause it to reciprocate said first member and spindle; and means to adjust said stop from its effective position to permit said second member to shift idly under the action of said cam and thereby to discontinue reciprocation of said spindle.

2. In a grinding machine, a support; a spindle rotatably and translatably journaled therein; a grinding wheel carried by said spindle; means to rotate said spindle; means to translate said spindle, said translating means comprising a first gear fixed to said spindle; a second gear rotatable and translatable relative to said first gear; speed change gearing connecting said first and second gears to rotate the latter from the former at an unequal speed; means connecting said first and second gears and rendered effective by the relative rotation between the two to move said first gear axially; means preventing axial movement of said second gear to cause the first gear to translate said spindle; and means to render said last named means ineffective.

3. In a grinding machine, a support; a spindle rotatably and translatably journaled therein; a grinding wheel carried by said spindle; means to rotate said spindle; a housing carried by said support; means located within said housing and actuated by said spindle to translate said spindle axially, said translating means comprising a first rotatable member fixed to said spindle; a second rotatable member; means to rotate said second member from said first member at a slightly different rate; means rendered effective by the relative rotation of said members to cause axial movement of said first member and said spindle; a fixed abutment provided by said housing and adapted to prevent axial movement of said second member in one direction; a movable abutment carried by said housing and adapted to prevent axial movement of said second member in the opposite direction; and means to move said movable abutment away from said second member to permit said second member to receive the axial movement and thereby discontinue the axial movement of said first member and said spindle.

4. A grinding-wheel oscillator combining a support; a spindle journaled therein; a first annular member; a second annular member; a connection for imparting a relative reciprocation between said members when they are relatively rotated; gearing for producing a relative rotation between said members; means prohibiting relative translation between said spindle and one of said members; means prohibiting relative translation between said support and said other member, and a manually adjustable device to render inoperative one of said means to permit said spindle to rotate without translating.

5. A grinding-wheel oscillator combining a support; a reciprocable spindle journaled therein; a first annular member; a second annular member; a cam and follower connection between said members for effecting relative reciprocation between said members when they are relatively rotated; gearing for producing a relative rotation between said members; means prohibiting relative translation between said spindle and one of said members; means prohibiting relative translation between said support and said other member; and manually actuated means to adjust said last-named means to an ineffective position to permit said other member to move idly under the action of said cam-groove.

In witness whereof, I hereunto subscribe my name.

SOL EINSTEIN.