H. W. NEWMAN.

GRINDING OR ABRADING MACHINE.

APPLICATION FILED MAR. 25, 1910.

1,042,817.

Patented Oct. 29, 1912.

4 SHEETS—SHEET 1.

FIG. 1.

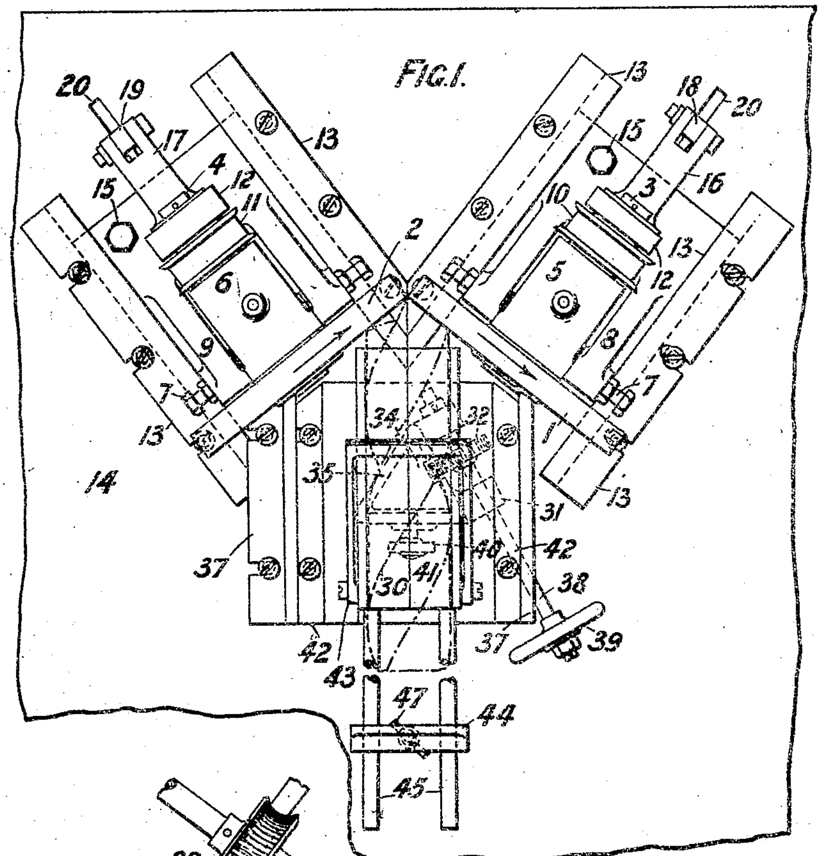
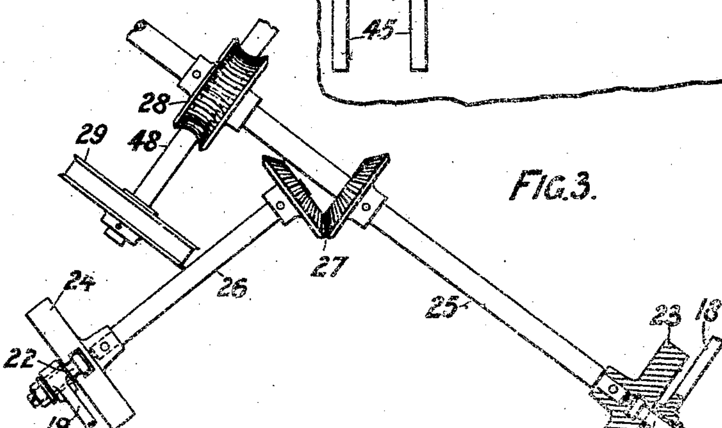


FIG. 3.



Witnesses

W. P. Burk

John A. Percival

Inventor:

Henry Walters Newman

BY Wm Wallace White

ATTY.

H. W. NEWMAN.
GRINDING OR ABRADING MACHINE.
APPLICATION FILED MAR. 25, 1910.

1,042,817.

Patented Oct. 29, 1912.

4 SHEETS—SHEET 2.

FIG. 2.

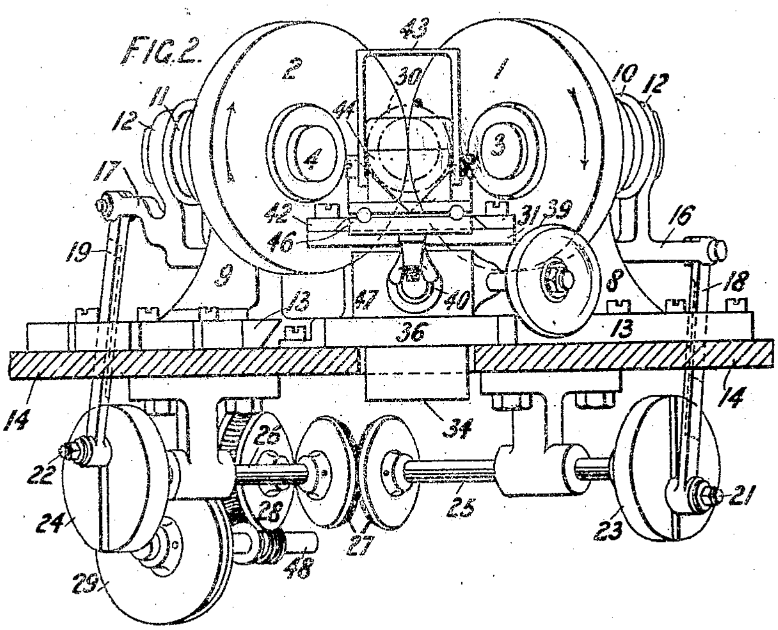
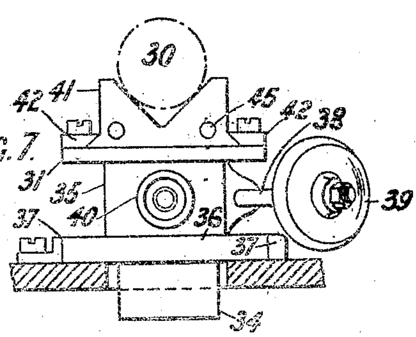


FIG. 7.



Witnesses

W. P. Burk

John A. Percival

Inventor

Henry Walter Newman

BY Wm Wallace White

ATTY.

H. W. NEWMAN.

GRINDING OR ABRADING MACHINE.

APPLICATION FILED MAR. 25, 1910.

1,042,817.

Patented Oct. 29, 1912.

4 SHEETS—SHEET 3.

FIG. 4.

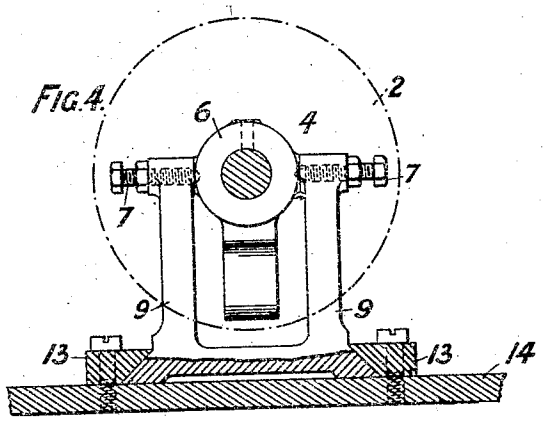


FIG. 5.

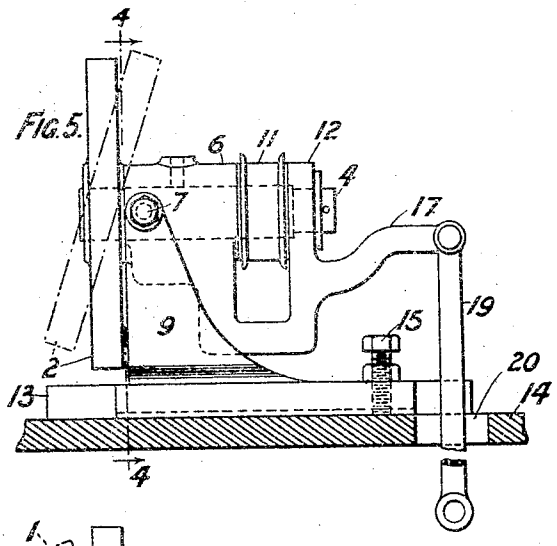
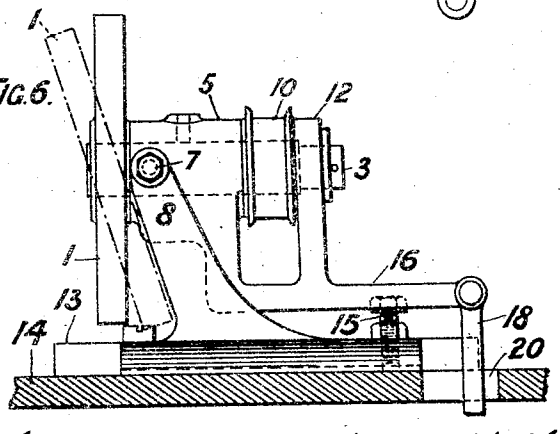


FIG. 6.



Witnesses

W. P. Burns

John A. Brown

Inventor

Henry Walters Newman

By Thos. Wallace White

Atty

H. W. NEWMAN.

GRINDING OR ABRADING MACHINE.

APPLICATION FILED MAR. 25, 1910.

1,042,817.

Patented Oct. 29, 1912.

4 SHEETS—SHEET 4.

FIG. 8.

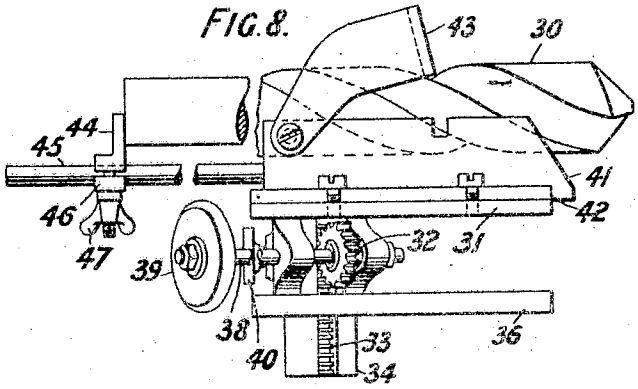


FIG. 9.

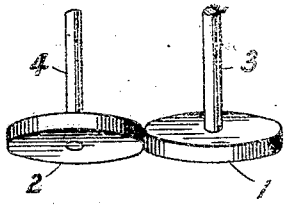


FIG. 11.

FIG. 10.

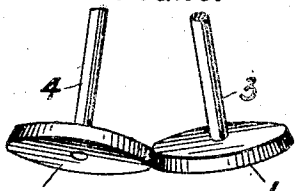


FIG. 12.

Witnesses

W. P. Burke

John G. Purcival

Inventor

Henry Walters Newman

By John Wallace White

Atty

UNITED STATES PATENT OFFICE.

HENRY WALTERS NEWMAN, OF MILL HILL, ENGLAND.

GRINDING OR ABRADING MACHINE.

1,042,817. Specification of Letters Patent. Patented Oct. 29, 1912.

Application filed March 25, 1910. Serial No. 551,426.

To all whom it may concern:

Be it known that I, HENRY WALTERS NEWMAN, a subject of the King of the United Kingdom of Great Britain and Ireland, residing at The Priory, Mill Hill, in the county of Middlesex, England, have invented new and useful Improvements in Grinding or Abrading Machines, of which the following is a specification.

This invention relates to grinding or abrading machines especially applicable for grinding drills and other tools or cutters, such as key grubs or end-slotting cutters, and it has for one of its objects so to construct the said machines as to enable them, at a single operation, to grind a drill with the necessary "backing off" behind each of its cutting edges, without necessitating the drill being rotated about its axis or moved angularly in a lateral direction.

The invention may be carried out in different ways, those hereinafter described and illustrated in the accompanying drawings, being given merely as convenient examples.

In the said drawings:—Figure 1 is a plan of one construction of the apparatus according to the present invention; Fig. 2 is a front elevation of the said apparatus with the bed plate shown in section; Fig. 3 is a plan of the driving mechanism situated beneath the bed plate; Fig. 4 is a sectional elevation on the line 4—4 of Fig. 5, looking in the direction of the arrows; Fig. 5 is a right-hand side elevation of the abrading disk and mountings seen at the left-hand side of Figs. 1 and 2, and as viewed in a direction perpendicular to the axis of rotation of the said disk; Fig. 6 is a right-hand side elevation of the abrading disk and mountings seen at the right-hand side of Figs. 1 and 2, and as viewed in a direction perpendicular to the axis of rotation of the said disk; Figs. 7 and 8 are respectively a front elevation and a left-hand side elevation of detached portions of the tool support; Figs. 9 and 10 are diagrammatic plan views of respectively different arrangements of the abrading disks; and Figs. 11 and 12 are perspective views of portions of tools for the grinding or sharpening of which the arrangements shown in Figs. 9 and 10 are respectively adapted.

In the arrangement illustrated in Figs. 1 to 8 of the drawings, and which is especially adapted for grinding straight-fluted and twist drills, there are provided two rotating grinding disks 1, 2 whose flat abrading faces—when vertical, as represented in Figs. 1 and 2—are at an angle to each other corresponding with the angle of the drill end or cutting edges, as shown clearly in Fig. 1, (wherein a drill 30 is represented in dot-and-dash lines) the peripheries of the said disks being in contact or nearly in contact with each other. Each of the disks 1, 2 is secured to its respective spindle 3 or 4 in any convenient manner, and each such spindle is free to rotate in a bearing 5 or 6 pivoted between two center studs 7 capable of being adjusted, and locked in adjusted position, in the two arms of a forked or double standard or slider 8 or 9. By this arrangement the bearing 5 or 6 is free to oscillate about a horizontal axis (viz., that of the respective studs 7) which is perpendicular to the axis of the spindle 3 or 4, and situated in a vertical plane preferably close to the rear of the respective abrading surface. As a means of rotating the spindles 3 and 4 there are shown to be secured thereon, pulleys 10, 11 respectively, each for receiving a driving strap (which is not represented in the drawings), and at the back of the said pulleys, each of the spindles is further rotatably supported in a bearing 12 integral with, or fast to, the bearing 5 or 6. The two standards or sliders 8, 9 are adjustable in converging directions in dovetail or equivalent guides 13 fast to the bed plate 14 (of which latter only a portion is shown in the drawings) and they may be secured in adjusted positions by any convenient means, such for example as the bolts and lock nuts 15, the former of which are threaded through holes in the bases of the standards 8, 9 and may be screwed hard down upon the bed plate 14. The two disks 1, 2, may both be rotated in the direction of the hands of a clock, as indicated by the arrows in Figs. 1 and 2, so that the adjacent parts of their peripheries travel in opposite directions, and each of the bearings 5, 6 is provided with an arm 16, or 17 respectively, fast thereto and pivotally connected to the upper end of a link 18 or 19, which passes through a slot 20 in the bed plate 14 and, at its lower end, is in pivotal connection with a crank pin 21 or 22 secured, preferably adjustably, in a crank disk 23 or 24. The crank disks 23, 24 are secured to shafts 25, 26 respectively, these shafts being geared to-

gether by equal bevel toothed gear 27 and the former of such shafts is rotated by worm gearing 28 driven by a strap pulley 29 fast on the worm shaft 48. The crank pins 21, 22 are secured in such positions in the disks 23, 24 as to cause the disks 1, 2 to be rocked from their vertical positions respectively in a forward and rearward direction, as indicated in dot and dash lines in Figs. 6 and 5 respectively, and again back into their respective vertical positions, the oscillations of the bearings 5, 6, for securing this result, being simultaneous but in relatively opposite directions, that is to say such directions that, as the upper part of the disk 1 is being advanced toward or over one side of the tool 30, the lower part of the disk 2 is, to a corresponding extent, being advanced beneath the other side of the said tool.

In front of the two abrading disks 1, 2 and situated symmetrically in relation thereto, there is provided a tool table 31 capable of being adjusted in a vertical direction to suit the different diameters of the tools to be ground. In the example illustrated this vertical adjustment of the tool table 31 is effected by means of a spur pinion 32 which gears with a toothed rack 33 fast to the pillar or vertical stem 34 of the said table. The pillar or stem 34 is of triangular shape in cross section, as shown in dotted lines in Fig. 1, and is free to slide vertically in a correspondingly triangular sleeve 35 (see particularly Fig. 7) which has a rectangular flange or base 36 capable of moving forward and backward in guides 37 in a direction symmetrical in relation to the angle formed by the two abrading disks 1, 2. The bed plate 14 is slotted to allow of the adjustment of the pillar 34, which penetrates such plate. The pinion 32 is secured on a shaft 38 supported in bearings fast to the sleeve 35, the said shaft being provided with a wheel or head 39 by which it may be turned by hand for raising or lowering the tool table 31. The sleeve 35 is further provided with a pinching screw or equivalent 40, by tightening which, the tool table 31 can be secured in any desired position of vertical adjustment. The tool table 31 is provided with a tool holder 41 which is movable in dovetail or equivalent guides 42 on the said table, the tool holder, as shown best in Figs. 2 and 7, being formed with a V-shaped groove in which the tool to be ground is laid, and in which it may be held in proper position by a yoke 43 pivoted to the sides of the tool holder 41. The horizontal member of the yoke 43 is adapted to engage with the groove of a twist drill so as to retain the said drill in the position necessary for insuring both of its cutting edges being symmetrically sharpened and "backed off" by the respective abrading disks 1, 2. The holder 41 is also provided with an abutment 44 adjustable along two rods 45 fast to the said holder, for engaging with the non-cutting end of the drill 30 and thereby assisting in holding the latter. The abutment can be secured in any desired position on the rods 45 by means of the clamping plate 46 and screw and winged nut 47.

From the foregoing it will be seen that the tool table 31, sleeve 35 and flange 36 are together adjustable upon the bed plate 14, toward and away from the abrading disks 1, 2, and that the tool holder 41 is also adjustable in like directions upon the tool table 31. Any desired means may be provided for securing the tool table 31 relatively to the bed plate 14, or the tool holder 41 to the tool table 31, but, as the action of the oscillating abrading disks 1, 2 on the tool end is causative of, or involves, a longitudinal reciprocation of the said tool, it is preferable that the tool table 31 be secured to the bed plate 14 and the tool holder 41 be left loose on the tool table so as to admit of the said holder being capable of sliding freely on the tool table; if desired, however, instead of the arrangement just mentioned, the tool holder may be secured to the tool table and the latter be slidable on the bed plate. When a drill is pressed into contact with the front surfaces of the rotating disks 1, 2 as indicated in dot-and-dash lines in Fig. 1, the said surfaces will sharpen the cutting edges of the drill, and the oscillation of the said surfaces will automatically produce the necessary curvilinear "backing off", the angle of the said "backing off" depending upon the length of throw for which the crank pins 21, 22, had previously been adjusted, and the drill meanwhile being reciprocated longitudinally by reason on the one hand, of the oscillation of the abrading disks 1, 2, causing the drill to be moved backward, and on the other hand the pressure exerted to keep the drill up to the abrading disks, moving it forward. The adjustment as before mentioned of the crank pins 21, 22 in the respective crank disks 23, 24, will necessitate practically the employment of longer and shorter links 18, 19, for insuring that the abrading bodies 1, 2, when in their zero positions, shall have their abrading faces vertical; for this purpose the said links may each be formed of two telescopically adjustable parts (as indicated in dotted lines in Fig. 2) so that they may be lengthened or shortened accordingly; or the same result may be secured by other means such for example as a substitution of other links of different lengths for those then on the machine, or by providing the bearing brackets 5, 6 with slots wherein the pins pivotally connecting the said brackets to the links 18, 19, may be adjusted to different positions.

For grinding flat drills it is not necessary that the rotating disks 1, 2 shall be oscillated, and consequently the bearings 5, 6 may be locked so as to retain the abrading faces of the said disks at the angles desired to be given to the "backing off" of the cutting edges. With the machine constructed as hereinbefore described, this result may conveniently be attained by merely preventing rotation of the worm shaft 48, after the disks 1, 2 have been canted to the required angle.

Should the before described abrading machine at any time be required for grinding a left-handed cutting drill, it may be readily adjusted for attaining that result by reversing the position of the crank pins 21, 22 on their respective crank disks 23, 24, that is to say, moving them diametrically across the said disks to opposite sides of the axes about which they respectively revolve.

The belts for transmitting motion to the pulleys 10, 11, are not shown in the drawings because they form no part of the present invention, but it will be readily understood that, in view of the arcual movement of these pulleys, the said bands are guided over suitable rollers, or otherwise, for the purpose of maintaining them at a proper tension and preventing them from leaving the said pulleys.

In a machine to be used for grinding only flat drills or key grubs or end-slotting cutters, the bearings may be permanently secured in the angular positions necessary for causing the abrading disks 1, 2, to produce the desired angle of "backing off", the axes of the spindles 3, 4 being situated in converging, parallel or diverging vertical planes according to the angle to be given to the cutting edges relatively to the axis of the respective tool, thus, for an ordinary flat drill, the said axes are situated in converging vertical planes as in Fig. 1, for a key-grub or end-slotting cutter wherein the cutting edges are perpendicular to the longitudinal axis of such tool, as shown in Fig. 11, the spindle axes are in parallel vertical planes, as diagrammatically illustrated in Fig. 9, while, for a tool having a hollow or recessed end, as shown in Fig. 12, the spindle axes are in diverging vertical planes as diagrammatically illustrated in Fig. 10.

Instead of the spindles 3, 4 being rotated by the means hereinbefore described, they may each be rotated by a separate electric motor operatively fast to the respective bearing 5, or 6, and, further, instead of the tools being held down on the holder 41 by a yoke 43 as previously explained, they may be retained thereon by a screw clamp or other convenient means.

The direction of rotation of the abrading disks or bodies 1, 2, may be either clockwise, that is to say, the direction followed by the hands of a clock, as previously mentioned in connection with Figs. 1 and 2, or counter-clockwise, or one disk or body may be rotated clockwise and the other one counter-clockwise, the rotation being transmitted to them by any convenient transmission devices.

It is to be noted that while, in the accompanying drawings, I have shown an abrading machine having the two abrading bodies arranged both substantially in the same horizontal plane (which is the preferred and most convenient arrangement) the invention is not restricted to that arrangement as, provided their mutual relationship is not affected, the said bodies might be arranged in substantially the same vertical or the same inclined plane.

I claim:—

1. A grinding or abrading machine comprising two revoluble abrading bodies each with a planary grinding face; bearings supporting said bodies in positions in which diametral lines upon respective grinding faces contain an angle equal to the angle contained by the cutting edges of the tool to be ground and in positions in which the planes containing respective grinding faces have relative angularity corresponding with the angle of backing off of said cutting edges; and driving means for revolving said bodies.

2. A grinding or abrading machine comprising two revoluble bodies; oscillatory bearings supporting said bodies in positions in which diametral lines upon respective bodies contain an angle equal to the angle contained by the cutting edges of the tool to be ground; driving means for revolving said bodies; and means operative to oscillate said bearings simultaneously with the operation of said driving means in order to vary the relative angularity of the planes containing the grinding faces of said bodies.

3. A grinding or abrading machine comprising a revoluble abrading body; an oscillatory bearing therefor; pivots supporting said bearing the axis of said pivots being parallel with the line of contact between the edge to be ground and the grinding face of said abrading body; driving means for revolving said body; and means adapted to oscillate said bearing about said pivots and thereby to rock said body simultaneously with the driving thereof.

4. A grinding or abrading machine comprising two revoluble abrading bodies; a tool support; oscillatory bearings mounted upon axes parallel respectively with the planes of the respective grinding faces and with the respective edges of the tool to be ground when said tool is on said support; driving means for revolving said bodies; and gear operatively connected with said bearings and adapted to simultaneously and

reversely oscillate said bearings and thereby to reversely rock said bodies simultaneously with the driving thereof.

5. A grinding or abrading machine comprising two revoluble abrading bodies each having a planary grinding face; bearings supporting said bodies with their peripheries in contact or close proximity at one point and with diametral lines upon the said grinding faces of the respective bodies passing through such point inclosing an angle approximately equal to the angle contained by the cutting edges of the tool to be ground; and driving means for revolving said bodies.

6. A grinding or abrading machine comprising a revoluble abrading disk; an oscillatory bearing therefor; a pivotal support for said bearing the axis of said support being situated to the rear of the grinding face of said disk and intersecting the axis thereof; a tool support at an angle to the axis of said disk; driving means for revolving said disk; and adjustable means operatively connected with said bearing for rocking it simultaneously with the driving of said body.

7. A grinding or abrading machine comprising two revoluble abrading disks the axes of which contain an angle; a tool support bisecting the said angle; oscillatory bearings for said disks; pivotal supports for said bearings, the respective axes of said supports being situated to the rear of respective grinding faces of the disks and intersecting the axes of respective disks; driving means for revolving said disks; and two similar adjustable gears operatively connected with said bearings and adapted to simultaneously reversely and equally oscillate said bearings during the driving of said bodies.

8. A grinding or abrading machine comprising two revoluble abrading disks the axes of which contain an angle; a tool support bisecting said angle; bearings adapted to support said disks about in peripheral contact and with the disks reversely inclined toward the tool on said support and driving means adapted to simultaneously rotate said bodies.

9. A grinding or abrading machine comprising a revoluble abrading body with a planary grinding face; an oscillatory bearing therefor; a pivotal support for said bearing, the axis of said support extending diametrically of said revoluble body; a tool slide adapted to support a tool at an angle to the axis of said body; driving means for revolving said body; means operative to oscillate said bearing on said pivotal support simultaneously with the driving of said body; and an adjustment operative on said means for varying the amplitude of the oscillations of said bearing.

10. A grinding or abrading machine comprising a revoluble abrading body; an oscillatory bearing therefor; a pivotal support for said bearing, the axis of said support intersecting the axis of said revoluble body; a tool slide adapted to support a tool at an angle to the axis of said body; driving means for revolving said body; and reversible means operative to rock said bearing from a given zero position in relatively opposite directions simultaneously with the driving of said body.

11. A grinding or abrading machine comprising a revoluble abrading body; a tool support; an oscillatory bearing for said body; a pivotal support for said bearing, the axis of said support being parallel with the edge to be ground of the tool when on said support; driving means for revolving said body; means operative to rock said bearing simultaneously with the driving of said body; a control for said means; and a lock operative to prevent the oscillation of said bearing when desired.

12. A grinding or abrading machine comprising two revoluble abrading bodies; a tool support; oscillatory bearings for supporting said bodies in such positions that diametral lines on the faces of said bodies inclose an angle equal to the angle inclosed between the cutting edges of the tool to be ground; driving means for simultaneously revolving said bodies; means operative to rock said bearing simultaneously with the driving of said bodies; and an adjustment for variably positioning the bodies in the directions of their respective axes.

13. A grinding or abrading machine comprising two revoluble abrading bodies; a tool support; oscillatory bearings for supporting said bodies in relative angular positions; sliders; pivotal supports for said bearings in said sliders; guides for said sliders; adjustments for fixing the positions of the sliders in respective guides; driving means for revolving said bodies; and means operative to oscillate said bearings simultaneously with the driving of said bodies.

14. A grinding or abrading machine comprising two revoluble abrading bodies; a tool slide adjustable toward and from said bodies; oscillatory bearings supporting said bodies in such positions that the angle inclosed by the axes of oscillation is bisected by the axis of a tool on said slide; sliders; pivotal supports for said bearings in said sliders; guides for said sliders parallel with the axes of said bodies; adjustments for fixing the positions of the sliders in respective guides; an adjustment for varying and fixing the tool support at different positions in the direction of its axis; driving means for revolving said bodies; and means operative to oscillate said bearings simultaneously with the driving of said bodies.

15. A grinding or abrading machine comprising two revoluble abrading bodies; a vertically adjustable tool support; oscillatory bearings for supporting said bodies in relative angular positions; sliders; pivotal supports for said bearings in said sliders; guides for said sliders; adjustments for fixing the positions of the sliders in respective guides; driving means for revolving said bodies; means operative to oscillate said bearings simultaneously with the driving of said bodies; and a locking means for fixing said tool support in any adjusted position.

16. A grinding or abrading machine comprising two revoluble abrading bodies; a tool support; oscillatory bearings for supporting said bodies; sliders; pivotal supports for said bearings in said sliders; guides for said sliders; adjustments for fixing the positions of the sliders in respective guides; driving means for revolving said bodies; and means inter-geared with said driving means and operative to simultaneously and oppositely rock said bearings.

17. A grinding or abrading machine comprising two revoluble abrading bodies; a vertically adjustable tool support; a horizontally adjustable slide carrying said support; oscillatory bearings for supporting said bodies; sliders; pivotal supports for said bearings in said sliders; guides for said sliders; adjustments for fixing the positions of the sliders in respective guides; driving means for revolving said bodies; oppositely driven shafts; cranks on said shafts; and connecting rods between respective cranks and bearings.

18. A grinding or abrading machine comprising two revoluble abrading bodies; a vertically adjustable tool support; a horizontally adjustable slide carrying said support; oscillatory bearings for supporting said bodies; sliders; pivotal supports for said bearings in said sliders; guides for said sliders; adjustments for fixing the positions of the sliders in respective guides; driving means for revolving said bodies; oppositely driven shafts; crank disks on said shafts; crank pins adjustable radially of said disks; arms extending axially from said bearings; and connecting rods pivotally connected between said crank pins and respective arms.

In witness whereof I have hereunto set my hand in the presence of two witnesses.

HENRY WALTERS NEWMAN.

Witnesses:

G. C. NEWMAN,

REUBEN WISE.