E. P. SACREY.

MACHINE FOR DRESSING GRINDING WHEELS.

APPLICATION FILED AUG. 29, 1916.

1,250,359.

Patented Dec. 18, 1917.

2 SHEETS—SHEET 1.

FIG. 1

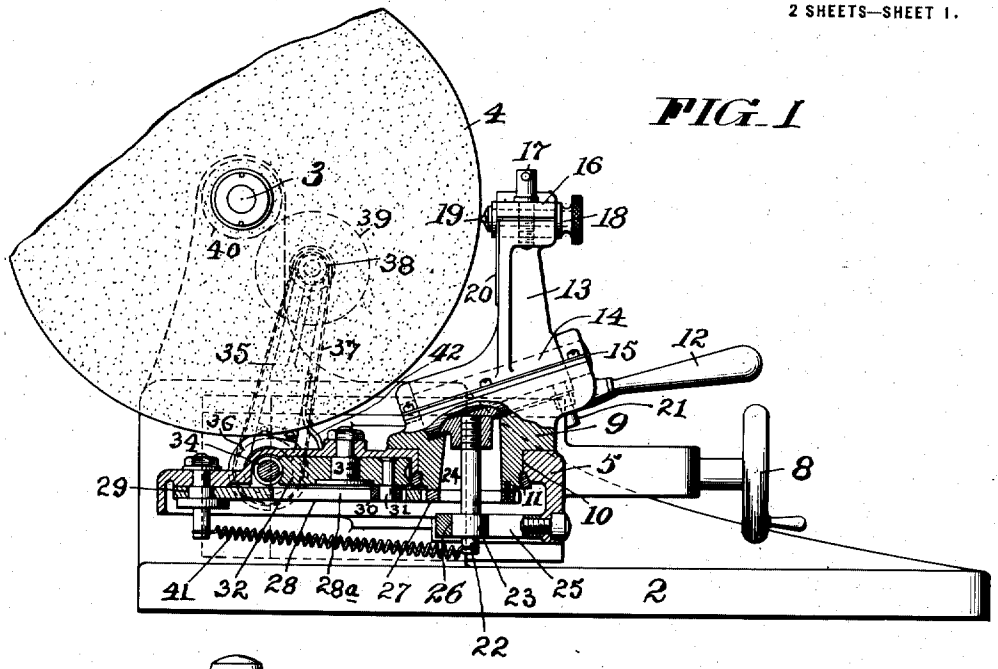
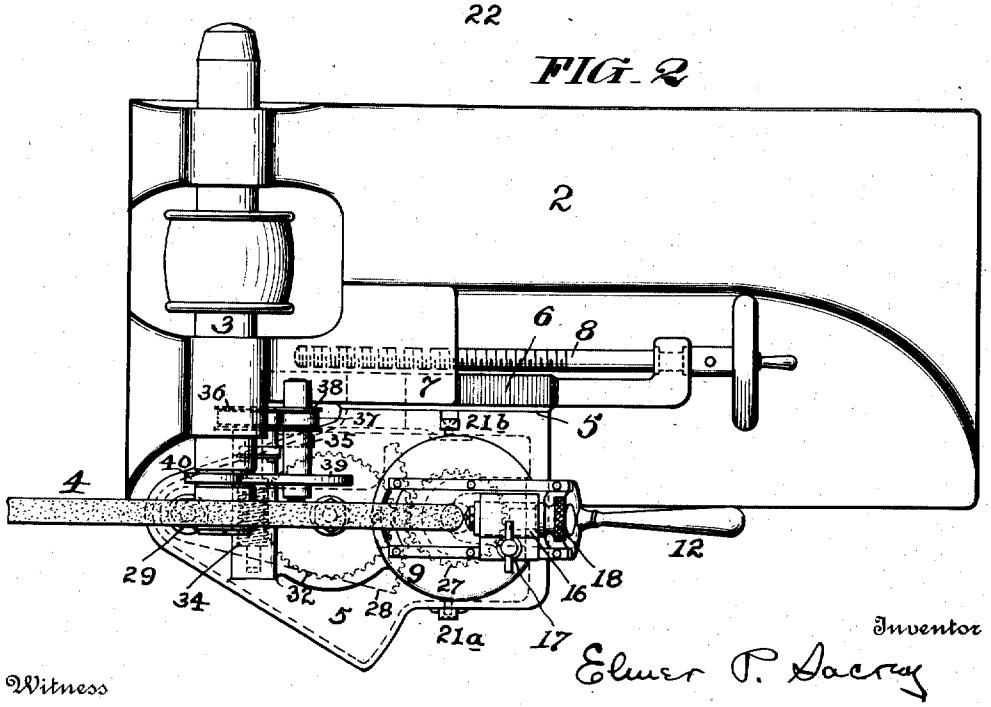


FIG. 2



Witness

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2 SHEETS—SHEET 2.

FIG. 3.

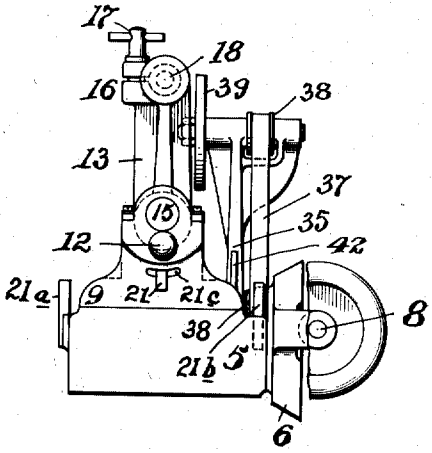


FIG. 5.

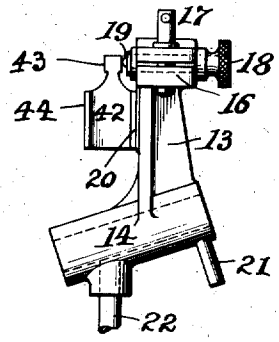


FIG. 4.

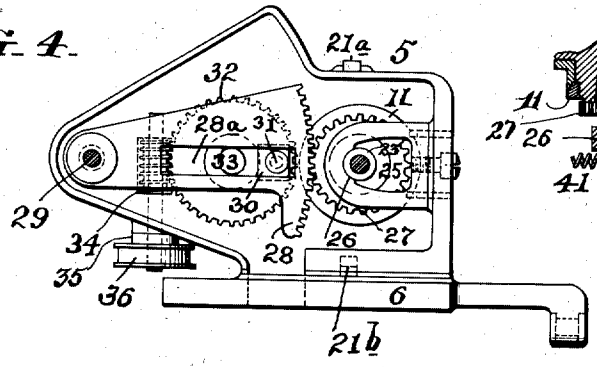


FIG. 6.

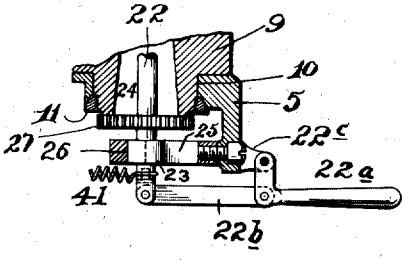
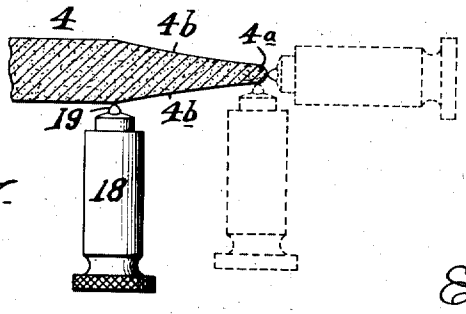


FIG. 7.



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UNITED STATES PATENT OFFICE.

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MACHINE FOR DRESSING GRINDING-WHEELS.

1,250,359. Specification of Letters Patent. Patented Dec. 18, 1917.

Application filed August 29, 1916. Serial No. 117,426.

To all whom it may concern:

Be it known that I, ELMER P. SACREY, a citizen of the United States, and resident of Philadelphia, county of Philadelphia, and State of Pennsylvania, have invented an Improvement in Machines for Dressing Grinding-Wheels, of which the following is a specification.

The object of my invention is to provide a construction of machine adapted to dressing emery or corundum grinding wheels in an efficient, speedy and accurate manner, giving to the grinding edge a semi-circular shape with or without inclined side surfaces connecting the normal side planes of the wheel with the semi-circular perimeter.

While my improvements may be employed as a self-contained machine, in practice I prefer to employ them as an auxiliary to an automatic grinding machine, such as set out in my application for Letters Patent filed March 30, 1916, Ser. No. 87,685, and in which association the grinding wheel is always in operative relation with the work, and the dressing devices are always in operative relation with the grinding wheel, so that the said wheel may be dressed to prescribed shape repeatedly and until worn down to a diameter too small to do effective work; the present improvements providing means for adjustment for bringing the diamond dressing tool and its associated parts into proper coöperation with the wheel to be ground, irrespective of its changing diameter.

With the foregoing and other objects in view, my invention consists of certain constructions and combinations of parts as fully described hereinafter and more specifically pointed out in the claims.

My invention will be better understood by reference to the drawings, in which:—Figure 1 is a side elevation (with part in section) of a machine embodying my invention; Fig. 2 is a plan view of the same; Fig. 3 is an end elevation of the more important parts thereof; Fig. 4 is an inverted plan view of the same; Fig. 5 is a side elevation of the diamond tool holder and operative arm showing the manner of adjusting the diamond point; Fig. 6 is a sectional view showing a modification of the manual control means; and Fig. 7 is a diagrammatic view showing the relative positions of the diamond point and holder when dressing the grinding surface of the wheel.

2 is a slide frame which, in the fully organized grinding machine of the application aforesaid, rests upon the main bed and is adjustable to and from the work, but for purposes of the present invention it may be considered as the bed and will be so referred to for convenience. This bed 2 is provided at its upper portion with a transverse shaft 3 to which the grinding wheel 4 is secured and by which it is rotated, and at its side near the lower portion it is provided with longitudinal guides 7, said guides at right angles to the shaft 3 and parallel to the plane of revolution of the grinding wheel 4. A slide frame 6 is adapted to the guides 7 and is adjustable thereon and bed 2 by adjusting screw 8 which may be manually operated as customary in lathe constructions. Secured to and projecting laterally from said slide 6, is a horizontal frame 5 upon which the dressing mechanism proper is mounted, said frame arranged below and in the plane of the grinding wheel.

Near the end of frame 5, vertically below the rear peripheral edge of the grinding wheel 4, is a circular bearing in which a turret 9 is journaled, said turret having a handle 12 by which it may be manually rotated about a vertical axis; the turret further provided at its upper part with a longitudinal inclined bearing 15 arranged in the plane of the wheel 4 and substantially tangential to its lower peripheral edge (Fig. 1). While it is not essential that the bearing 15 be substantially tangential to the grinding wheel 4, it is desirable for compactness of the apparatus that this feature in the design be followed. Journaled upon the oblique bearing 15 is the swinging hinged arm 13, said arm having at the bottom a long hub 14 journaled upon the bearing 15 and at the top a clamp 16 for holding the tool holder 18 which is provided with the diamond point 19. The tool holder 18 is cylindrical and loosely fits a corresponding hole in the clamp 16 so that it may be adjusted to and from the wheel 4 and radially thereof so that normally the diamond 19 will come exactly in the middle of the transverse face of the grinding wheel. The clamp 16 is split at one side and provided with a clamping screw 17 by which the holder may be clamped in position when adjusted. The bearing 15 is made long so as to prevent any lost motion in the direction of strain upon the diamond point when the dressing operation is being had. In practice, the tool 18

may be adjusted so that the diamond point 19 will be exactly in the vertical axis of the turret, in which case a rotation of the turret will not cause the said diamond point to traverse the peripheral edge of the wheel transversely; if, however, the tool be set one-eighth of an inch back of the axis of the turret, then the diamond will traverse a semi-circle having a radius of one-eighth of an inch, and in this manner give to the peripheral edge of the wheel 4 a corresponding shape (Figs. 2 and 7). In this way, any desired radius of curvature may be had, thus a large radius as in Fig. 2, or a small radius as in Fig. 7. The accuracy of these radii may be insured by employing a suitable gage 42 (Fig. 5) having parallel flat surfaces 43 and 44 so stepped that the surface 44 may rest against a gage surface 20 on the arm 13 and present a surface 43 in alinement with the diamond and against which it may be adjusted before its holder 18 is clamped to the arm. The gage 42 has two sets of parallel surfaces 43 and 44, one pair being separated a distance equal to one-eighth of an inch and the other pair separated a distance equal to one-half of an inch. Of course, it will be understood that the gages may be for any other radial distances desired for the curved peripheral shape of the grinding wheel, and hence the above are only given by way of example, being those commonly employed.

While the turret is being rotated to form the semi-circular dressing of the grinding wheel, it is essential that means shall be provided to prevent the arm 13 and its diamond tool swinging about the oblique axis 15, and this I accomplish in the following manner: Extending downward from the lower part of the hub 14 of the arm 13 is a rod 22 having a hardened steel collar 23, the axis of said collar being normally coincident with the vertical axis of the turret and being so positioned by fitting a curved socket 26, also of steel, which is secured to the frame 5. This socket 26 is slightly less than a semicircle and opens into a large clearance space 25 within which the rod 22 and its collar 23 may have free play when the oblique surfaces 4^b (Fig. 7) are being dressed, as later described. Normally, the collar 23 is held in the socket 26 by the spring 41, connected at one end with a stud 29 on the frame 5, and at the other end with the end of the rod 22 (Fig. 1). It will further be observed that the central portion of the turret is formed with a large vertical opening 24 through which the rod 22 may extend and have free lateral play when necessary. The turret may be held against rising in its bearing on frame 5 by the collar 11 screwed upon the lower end of its bearing; and as shown in Fig. 1, this collar may have a tapered construction to take up all lost motion from wear.

So far, I have described the turret and its attachments as if moved by hand through the handle 12, but I provide automatic means for giving rotary reciprocation to the turret and will now describe said means. To the bottom of the turret I secure an annular gear 27, which is engaged and operated by a segmental gear 28 pivoted upon the stud 29 and given a reciprocal motion by a crank wheel 32. The wheel 32 is journaled on a stud 33 on frame 5 and has its periphery formed with teeth so that it constitutes a worm wheel. This worm wheel 32 is driven by a worm 34 journaled in the frame 5 and having at its end a belt wheel 36 by which it is rotated. The worm wheel 32 is provided with a crank pin 31 and hence becomes a crank wheel, said crank pin having a box 30 which slides in a radial slot 28^a in the segmental gear 28. As the worm wheel 32 rotates, it reciprocates the segmental gear and thereby imparts a rotary reciprocatory motion to the turret. The belt wheel 36 may be driven by any suitable means, but I prefer that it shall be driven by the shaft 3 of the grinding wheel, and this I accomplish by the following instrumentalities, viz.: An arm 35 is hinged at its lower end concentric with the worm 34 or its shaft extensions and carries at its upper or free end a second belt wheel 38 having integral with or secured to it a friction wheel 39. The belt wheel 36 on the worm and the upper belt wheel 38 are belted together by belt 37, so that the rotation of the friction wheel 39 and its belt wheel 38 will rotate the worm 34. The friction wheel 39 contacts with a friction wheel 40 on the shaft 3 of the grinding wheel, so that the rotation of the latter causes the dressing apparatus to be put into operation and the turret thereof given a rotary reciprocation movement, as described. The arm 35 may be held in operative position in any suitable manner, one convenient way of accomplishing this result being to provide a spring 42 on the frame 5 which acting upon the arm 35 gives it a yielding connection, so that it will hold the friction wheels 39 and 40 in engagement during the dressing operation, said means being shown by way of example and not as restriction.

When the grinding wheel has been dressed and is employed in grinding, it is manifest that the dressing mechanism should be out of operation, and this is accomplished by operating the hand screw 8 to move the slide 6 backward and the friction wheel 39 out of engagement with wheel 40.

I will now describe the means for causing the dressing tool to dress the oblique surfaces 4^b (Fig. 7) upon the grinding wheel 4, when such additional shaping is required. The hub 14 of the arm 13 has a downwardly extending steel pin 21 having free play in a slot 21^c in the turret 9. This pin is

arranged to come into contact with lugs 21^a and 21^b on the frame 5 respectively at the termination of each reciprocation of the turret; that is to say, when the turret rotates in one direction it brings the pin 21 in contact with stop lug 21^a just before the termination of said movement, and this gives to the arm a slight rocking motion about the bearing 15 so that the diamond point is made to traverse a line 4^b, Fig. 7, somewhat oblique to the plane of rotation of the grinding wheel. The same operation takes place at the termination of the movement of the turret in the opposite direction, when the pin 21 contacts with the stop lug 21^b, only the oblique swinging of the diamond is in the opposite direction. In this way, not only is the semi-circular edge 4^a formed on the wheel, but the oblique surfaces 4^b are also formed. The angle of these surfaces 4^b is governed by two conditions, namely, the obliquity of the bearing 15 on the turrent and the time of contact of the pin with the lugs 21^a and 21^b, but this being a matter of refinement needs no further consideration. The lugs 21^a and 21^b are made of steel and fastened in position, so that they can be replaced when worn. The same is true of the pin 21.

It will now be understood that when the arm 13 swings about the oblique bearing 15, it moves obliquely to the plane of the grinding wheel 4, and the diamond point 19 traverses the surface of the wheel in an arc of a circle about the said bearing 15 as an axis, with the result that the surfaces 4^b are formed on the wheel very slightly curved inwardly or what may be termed "dished", as indicated in Fig. 7, the amount of the "dish" being more or less dependent upon the radial length of the arm 13. It will further be understood that at the moment of contact of the pin 21 with the pins 21^a and 21^b, the collar portion 23 leaves the socket 26 and moves freely in the space 25, the diamond point 19 being then under the control of the pin 21 and stops on the one hand, and the wheel surface 4^b and spring 41 on the other.

In Fig. 6, I have shown a handle 22^a of a bent lever construction hinged to an extension 22^c of the frame 5, and connected by a link 22^b with the bottom of the rod 22, whereby the arm 13 may be oscillated by manual manipulation when the turret is turned sufficiently to release the collar 23 from the socket 26. The handle 12 may be employed to oscillate the turret if so desired, but I prefer however to cause the oscillation of the arm 13 in an automatic manner.

I have described my invention as intended for dressing the grinding wheel with a semi-circular peripheral edge, but it is manifest that if the adjustment of the diamond point 19 be to the left of the vertical axis of the turret (Fig. 1), then the diamond point will act to cut a groove in the peripheral edge of the wheel instead of a rounded edge, and such surfaces may be made with varying degrees of curvature according to the adjustment of the diamond point.

I have described my invention in the preferred form and suitable for direct application to an automatic grinding machine, and while I have shown details of construction which are satisfactory in commercial practice, nevertheless I do not restrict myself to said details as they may be modified or varied in many ways without departing from the essential features of the invention specified in the claims.

Having now described my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. In a device of the character stated, the combination of a shaft for a grinding wheel, with a frame adjustable to and from the shaft in the direction at right angles thereto, a turn-table on the frame movable about a vertical axis arranged in the plane of rotation of the grinding wheel to be carried by the shaft, an arm hinged to the turn-table on an oblique axis normally arranged in the plane of rotation of the grinding wheel to be carried by the shaft, a dressing tool carried at the free end of the arm and having its cutting point relatively close to the axis of the turn-table, means for imparting a rotary reciprocation to the turn-table, and means for imparting an oscillation to the hinged arm outward at each of the terminating movements of rotary reciprocation of the turn-table.

2. In a device of the character stated, the combination of a shaft for a grinding wheel, with a frame adjustable to and from the shaft in the direction at right angles thereto, a turn-table on the frame movable about a vertical axis arranged in the plane of rotation of the grinding wheel to be carried by the shaft, an arm hinged to the turn-table on an oblique axis normally arranged in the plane of rotation of the grinding wheel to be carried by the shaft, a dressing tool carried at the free end of the arm and having its cutting point relatively close to the axis of the turn-table, means for imparting a rotary reciprocation to the turn-table, means for normally holding the arm against oscillation during the main rotary motion of the turn-table, and means for imparting an oscillation to the hinged arm outward at each of the terminating movements of rotary reciprocation of the turn-table.

3. In a device of the character stated, the combination of a shaft for a grinding wheel, with a frame adjustable to and from the shaft in the direction at right angles thereto, a turn-table on the frame movable about a vertical axis arranged in the plane of rotation of the grinding wheel to be carried by

the shaft, an arm hinged to the turn-table on an oblique axis normally arranged in the plane of rotation of the grinding wheel to be carried by the shaft, a dressing tool carried at the free end of the arm and having its cutting point relatively close to the axis of the turn-table, means for imparting a rotary reciprocation to the turn-table, and means for imparting an oscillation to the hinged arm outward at each of the terminating movements of rotary reciprocation of the turn-table, consisting of a pin extending from the hinged arm, and two fixed stop lugs on the frame and against which the pin alternately strikes.

4. In a device of the character stated, the combination of a shaft and grinding wheel, with a frame adjustable to and from the grinding wheel in the direction of the plane of its rotation, a turn-table on the frame movable about a vertical axis arranged in the plane of rotation of the grinding wheel, an arm hinged to the turn-table on an oblique axis normally arranged in the plane of rotation of the grinding wheel, a dressing tool carried at the free end of the arm and having its cutting point relatively close to the axis of the turn-table, means for imparting a rotary reciprocation to the turn-table, means for normally holding the arm against oscillation during the main rotary motion of the turn-table, consisting of a downwardly extending portion from the hinged arm, a fixed socket for receiving the downwardly extending portion at one side and a spring for normally holding the downwardly extending portion in the socket and means for imparting an oscillation to the hinged arm outward at each of the terminating movements of rotary reciprocation of the turn-table.

5. In a device of the character stated, a rotatable shaft for a grinding wheel, a frame adjustable in the direction at right angles to the shaft, a turn-table journaled on the frame and rotatable about an axis in the plane of the grinding wheel to be carried by the shaft, an arm hinged to the turn-table on an oblique axis and normally in the plane of the grinding wheel to be carried by the shaft and carrying at its free end a cutting tool, means for imparting a rotary reciprocation to the turn-table and an oscillation to the hinged arm outwardly during the termination of each reciprocation of the turn-table, and power devices for operating the said means.

6. In a device of the character stated, a rotatable shaft for a grinding wheel, a frame adjustable in the direction at right angles to the shaft, a turn-table journaled on the frame and rotatable about an axis in the plane of the grinding wheel to be carried by the shaft, an arm hinged to the turn-table on an oblique axis and normally in the plane of the grinding wheel, to be carried by the shaft and carrying at its free end a cutting tool, means for imparting a rotary reciprocation to the turn-table and an oscillation to the hinged arm outwardly during the termination of each reciprocation of the turn-table, and power devices for operating the said means driven from the shaft of the grinding wheel.

7. In a device of the character stated, a rotatable shaft for a grinding wheel, a frame adjustable in the direction at right angles to the shaft, a turn-table journaled on the frame and rotatable about an axis in the plane of the grinding wheel to be carried by the shaft, an arm hinged to the turn-table on an oblique axis and normally in the plane of the grinding wheel to be carried by the shaft and carrying at its free end a cutting tool, means for imparting a rotary reciprocation to the turn-table and an oscillation to the hinged arm outwardly during the termination of each reciprocation of the turn-table consisting of a gear on the turn-table, a worm and worm-wheel said worm-wheel having a crank pin, a rocking gear segment oscillated by the crank pin and meshing with the gear on the turn-table, a pin on the hinged arm, stop lugs on the frame against which the pin is alternately brought into contact at the time of reversal of the turn-table, and power devices for operating the said means.

8. In a device of the character stated, a shaft for a grinding wheel, combined with a turret movable about a vertical axis, an arm hinged to the turret on an oblique axis normally in the plane of the grinding wheel to be carried by the shaft, a cutting tool carried by the hinged arm, and means actuated by the turret when given rotary reciprocation to oscillate the hinged arm at the times of reversal of the movement of the turret.

9. In a device of the character stated, a shaft for a grinding wheel, combined with a turret movable about a vertical axis, an arm hinged to the turret on an oblique axis normally in the plane of the grinding wheel to be carried by the shaft, a cutting tool carried by the hinged arm, means actuated by the turret when given rotary reciprocation to oscillate the hinged arm at the times of reversal of the movement of the turret, and means for adjusting the turret to and from the shaft for the grinding wheel.

10. In a device of the character stated, a shaft for a grinding wheel, combined with a turret movable about a vertical axis, an arm hinged to the turret on an oblique axis normally in the plane of the grinding wheel to be carried by the shaft, a cutting tool carried by the hinged arm, means actuated by the turret when given rotary reciprocation to oscillate the hinged arm at the times

of reversal of the movement of the turret, power means for imparting rotary reciprocating motion to the turret, and hand operated means for putting the power means in and out of operation and causing the turret to be moved toward and from the shaft for the grinding wheel.

11. In a device of the character stated, a shaft for a grinding wheel, combined with a tool support rotatable about a vertical axis, a hinged arm mechanically attached to the tool support so as to swing laterally and forwardly to either side of the axis of the support, a cutting tool carried upon the free end of the hinged arm, and mechanical means for simultaneously giving rotary reciprocating movement to the support and oscillatory to the hinged arm.

12. In a device of the character stated, a shaft for a grinding wheel, combined with a tool support rotatable about a vertical axis, a hinged arm mechanically attached to the tool support so as to swing laterally and forwardly to either side of the axis of the support, a cutting tool carried upon the free end of the hinged arm, mechanical means means for simultaneously giving rotary recating movement to the support and oscillatory to the hinged arm, and means for adjusting the support to and from the shaft for the grinding wheel.

13. In a device of the character stated, a shaft for a grinding wheel, combined with a tool support rotatable about a vertical axis, a hinged arm mechanically attached to the tool support so as to swing laterally and forwardly to either side of the axis of the support, a cutting tool carried upon the free end of the hinged arm, mechanical means for simultaneously giving rotary reciprocating movement to the support and oscillatory to the hinged arm, and devices for automatically putting the mechanical means into operation and feeding the support toward the shaft of the grinding wheel and out of operation when moving the support away from the shaft for the grinding wheel.

14. In a device of the character stated, a shaft for a grinding wheel carried thereby, combined with a cutting tool for dressing its peripheral edge and adjacent side faces, and automatically operated means for imparting to the cutting tool motions in a semi-circle to round the peripheral edge of the wheel and also motions in a radial direction of the wheel at each terminus of the semi-circular movement but obliquely to the plane of its rotation for forming beveled side surfaces adjacent to the peripheral edge.

15. In a device of the character stated, a shaft for a grinding wheel carried thereby, combined with a cutting tool for dressing its peripheral edge and adjacent side faces, automatically operated means for imparting to the cutting tool motions in a semi-circle to round the peripheral edge of the wheel and also motions in a radial direction of the wheel at each terminus of the semi-circular movement but obliquely to the plane of its rotation for forming beveled side surfaces adjacent to the peripheral edge, and manually controlled means for putting the cutting tool into and out of action.

In testimony of which invention I hereunto set my hand.

ELMER P. SACREY.

Witnesses:
R. M. HUNTER,
KATHRYN A. SUMMERS.