B. M. W. HANSON.

WHEEL DRESSING MECHANISM.

APPLICATION FILED JULY 31, 1918.

1,416,667.

Patented May 16, 1922.

2 SHEETS—SHEET 1.

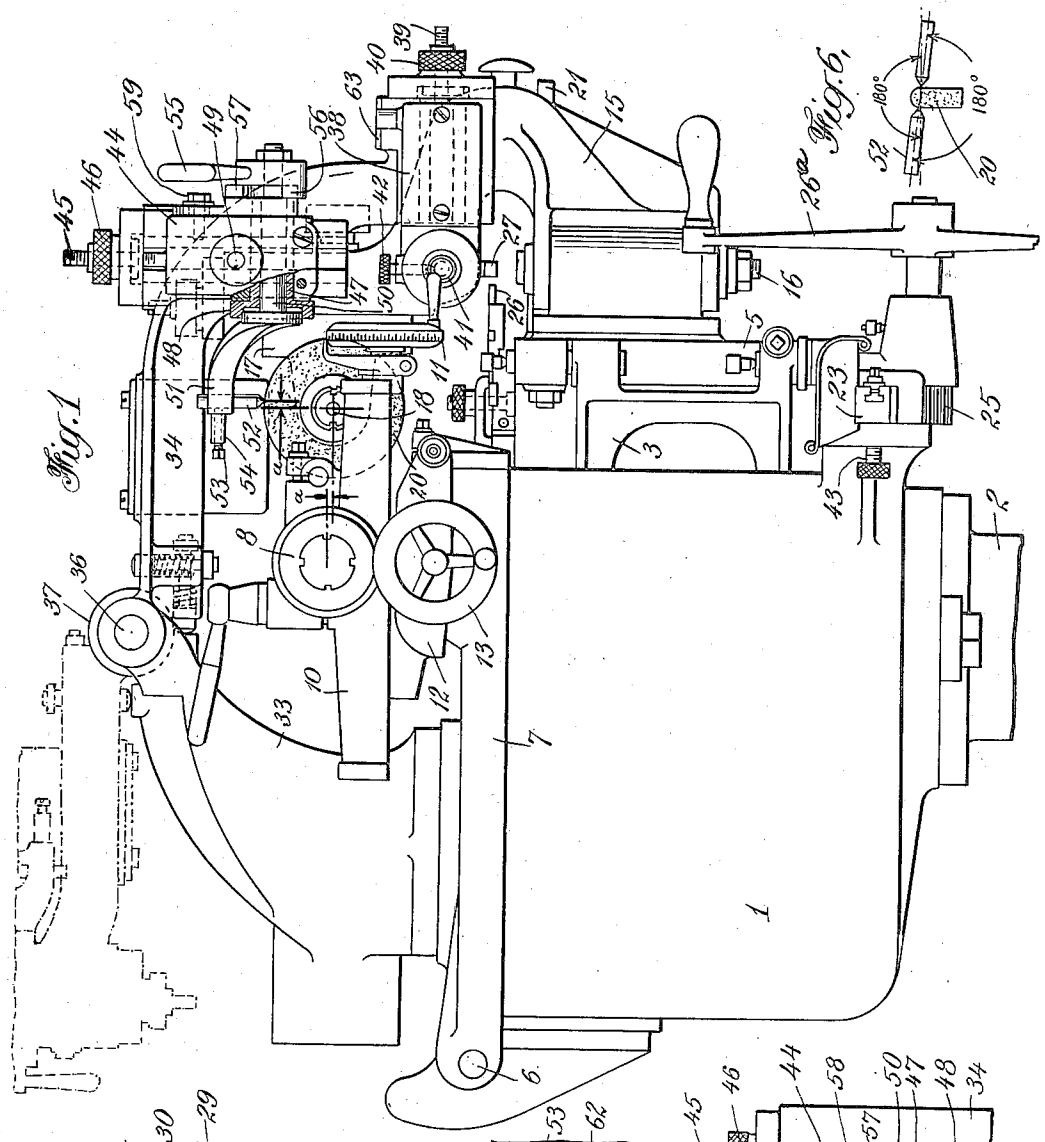


Fig. 1

Fig. 6

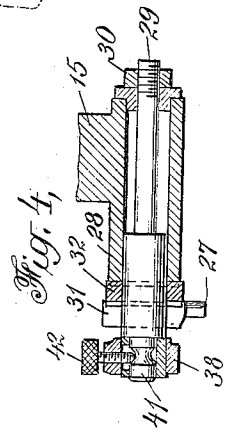


Fig. 4

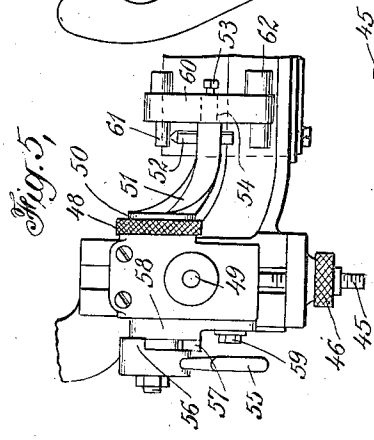


Fig. 5

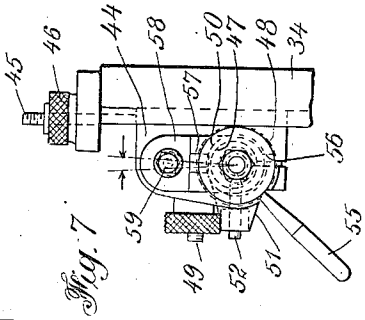


Fig. 7

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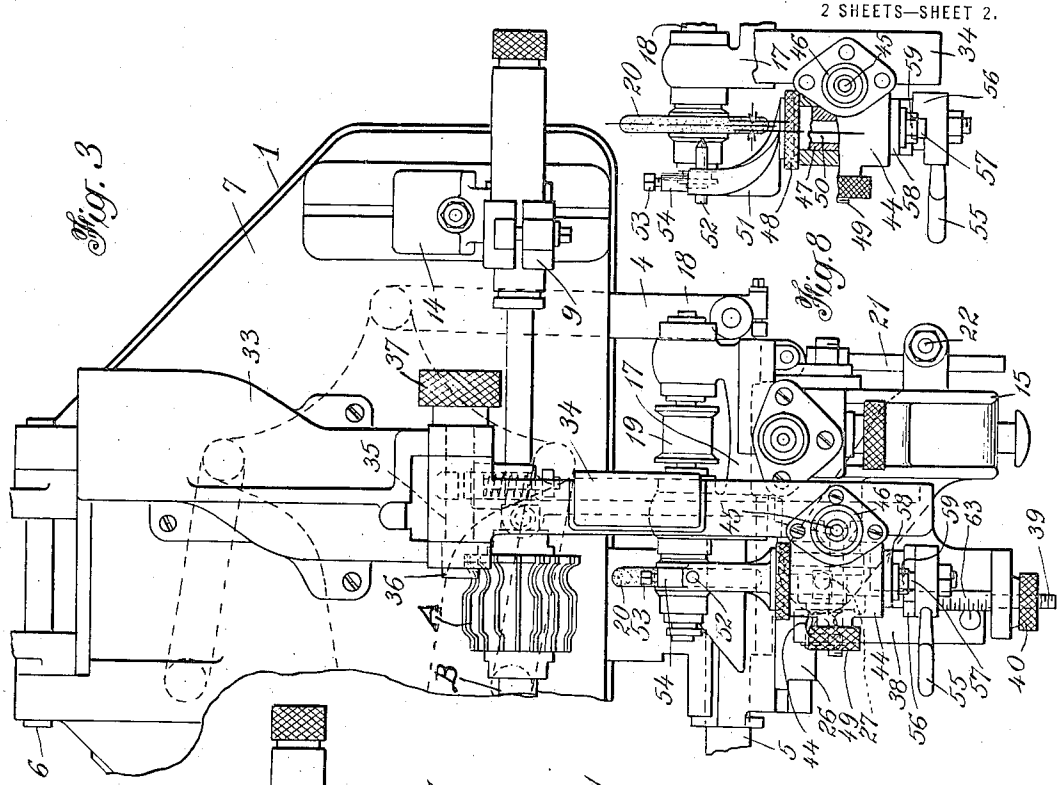


Fig. 3

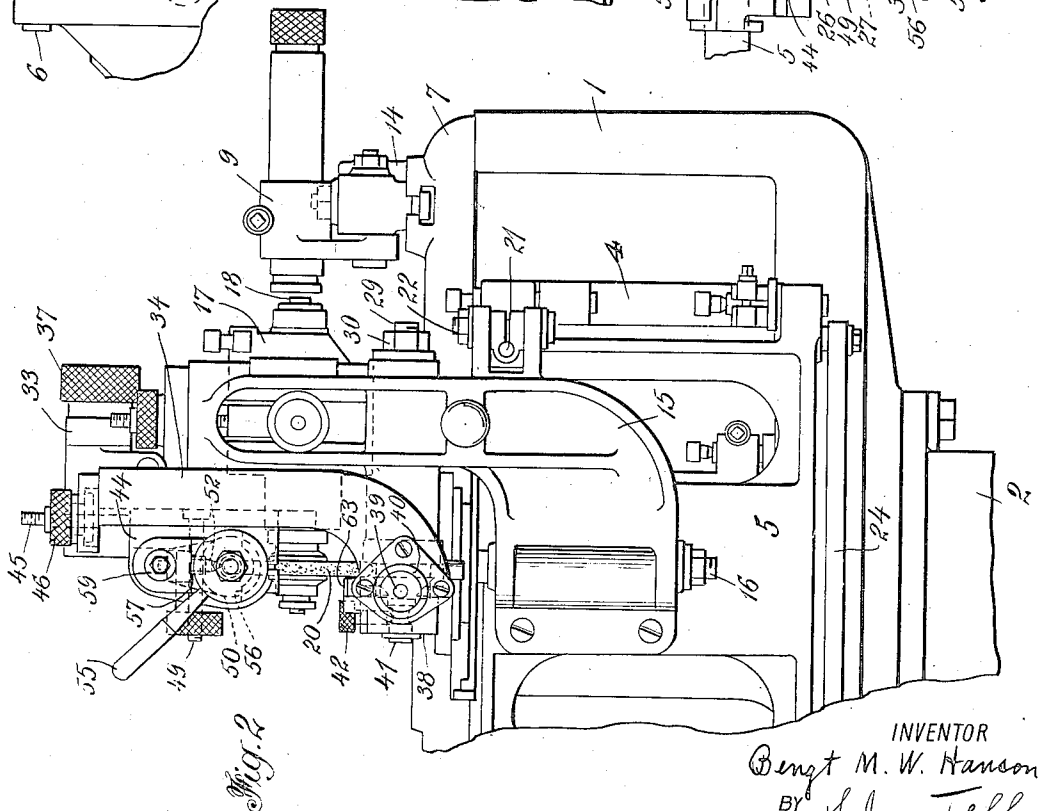


Fig. 2

Fig. 8

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WHEEL-DRESSING MECHANISM.

1,416,667. Specification of Letters Patent. Patented May 16, 1922.

Application filed July 31, 1918. Serial No. 247,636.

To all whom it may concern:

Be it known that I, BENGT M. W. HANSON, a citizen of the United States, residing at Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Wheel-Dressing Mechanism, of which the following is a specification.

This application constitutes, as concerns a part of its subject matter, a continuation of my copending application for metal reducing machines, Serial No. 102,458, filed June 8th, 1916, upon which has been issued Patent No. 1,341,799, dated June 1, 1920.

One of the objects of the invention is to provide, in a machine of this type, a wheel dressing mechanism adapted to be readily moved into or out of operative relation with the grinding wheel. Another object is to provide improved means for supporting, adjusting and moving the dressing tool. Still further objects will be apparent from the following specification and claims.

The accompanying drawings show the embodiment of the invention which I now deem preferable, but it will be understood that numerous changes may be made without departing from the spirit of the invention as set forth in the claims appended to this specification. In order that the invention may be clearly understood I have shown the wheel dressing mechanism combined with a grinding machine of the type set forth in my aforesaid copending application but which is shown more fully in my copending application for contour grinding machines, Serial No. 247,631, filed on even date herewith.

Of the drawings:

Fig. 1 is a side elevation of a grinding machine having a wheel dressing mechanism embodying the invention.

Fig. 2 is a front elevation of a part of the machine.

Fig. 3 is a plan view of a part of the machine.

Fig. 4 is a fragmentary vertical sectional view showing the device for connecting the wheel dressing mechanism with the wheel support.

Fig. 5 is a view showing a gage for adjusting the wheel dressing tool for wheels of different thicknesses.

Fig. 6 is a diagrammatic view showing the movement which the wheel dressing tool must have when the point thereof is eccentric.

Fig. 7 is a view illustrating the adjustment of the operating handle to provide the change of position indicated in Fig. 6.

Fig. 8 is a horizontal sectional view showing the eccentric sleeve for adjusting the wheel dressing tool.

Referring to the drawings 1 represents the main frame of the machine which is or may be mounted upon a base or pedestal 2 of any desired construction. The frame 1 is preferably in the form of a hollow box or housing within which are mounted the devices for supporting and controlling the movement of the grinding wheel. These supporting and controlling devices are adapted to permit the wheel to move horizontally in any direction, but they hold it in parallelism while being so moved. Preferably I provide for this purpose a pantographic mechanism comprising in part two parallel links 3 and 4, which extend forward through openings in the frame and at their forward ends are pivotally connected with a plate 5. Because of the pantographic connection the plate 5, while freely movable horizontally in any direction, is nevertheless always maintained in parallelism. The grinding wheel is carried by the plate 5 by means of devices to be described and is thus bodily movable with respect to the cutter or other part to be ground.

Hinged to the main frame 1 at 6 is a bed plate 7. This plate 7 together with the devices carried thereby can be swung upward about the hinge axis to expose the linkage and other parts contained within the housing 1. To the plate 7 are secured the wheel dressing mechanism and the devices which support the cutter or other part to be ground. For holding the shank of the cutter to be ground, or for holding an arbor on which the cutter is mounted, I provide a main work holder 8 and preferably a supplemental work holder or tailstock 9. As illustrated, there is a cutter A mounted on an arbor B, and means are provided whereby the cutter may be indexed. Preferably the work holder 8 is carried by a slide 10 which is movable forward and backward under the

control of a screw operated by a hand wheel 11. The slide 10 is mounted on a second slide 12 which is movable transversely on ways carried by the plate 7. For moving the slide 12 there is provided a screw operated by a hand wheel 13. Preferably the tailstock 9 is secured to a slide 14 which is movable forward and backward on the plate 7.

As I have already stated, the grinding wheel is carried by the plate 5. Preferably there is a grinding wheel supporting bracket 15 which is vertically pivoted to the plate 5 by means of a pivot pin 16. The upper part of the bracket is provided with vertical ways which engage a vertically adjustable slide 17. The slide 17 is provided with alined horizontal bearings in which is mounted a spindle 18. For rotating the spindle there is provided a belt wheel 19. A grinding wheel 20 is mounted on the spindle 18 but is readily detachable so that another wheel can be substituted when required. In order that the bracket 15 may be locked in any desired position of angular adjustment with respect to the plate 5 there is provided a rod 21 pivoted at one end to the plate. By means of a bolt 22 the bracket can be frictionally connected with the rod so as to lock the bracket 15 and the associated parts in any desired position.

In order that the operator may conveniently move the plate 5 and attached parts transversely, I provide a sliding rack bar 23 which is suitably guided on the frame 1. This bar is connected with the plate 5 by means of a link 24. A rotatable pinion 25 meshes with the rack and a hand lever 26ª is provided for turning it. In this way the bar 23 can be moved longitudinally carrying with it the plate 5 and all connected parts.

At the front of the machine there is located a former plate 26 which is used to guide the plate 5 and associated parts as they are moved transversely. The bracket 15 carries a former stud 27 which is adapted to engage and cooperate with the former 26. For securing the former stud 27 there is provided on the bracket 15 a hollow boss 28 through which extends a slotted bolt 29. The bolt extends entirely through the bracket and at the end opposite to the slot is provided with a nut 30. The former stud 27 has an enlarged shank 31 which extends through the slot in the bolt 29 and which engages the end of the boss 28 or engages a washer 32 which is interposed. It will be clear that when the former stud has been put in place, as shown, it can be secured by tightening the nut 30. In operation a former stud 27 is selected having the same width as the wheel.

For a left-hand cutter such as is shown in Fig. 3, the grinding wheel is adjusted vertically so that its axis lies a suitable distance *a* below the axis of the cutter. This adjustment permits the wheel to cut deeper behind the cutting face of each tooth than at the cutting face, thus providing the necessary relief. For a right-hand cutter the wheel is adjusted so that its axis occupies a corresponding position above the axis of the cutter. The cutter to be ground is put in place in the way shown, and a former 26 is selected which corresponds in contour to the contour of the cutter to be ground. The operator then moves the wheel longitudinally of the cutter at the same time pressing inward to cause the former stud 27 to follow the contour of the former 26. If necessary, the wheel is moved along the cutter several times until grinding of the tooth is completed. When required the wheel may be adjusted angularly as set forth in my application Serial No. 247631.

In order that the cutter may be accurately ground in conformity with the contour of the former, it is necessary for the edge of the wheel to be accurately trued. For properly truing the wheel from time to time there is provided the wheel dressing mechanism to which my present invention primarily relates.

Extending upward from the plate 7 is a bracket 33 to which is hinged the arm or frame 34 of the dressing mechanism. The arm 34 is mounted on a pin 35 which extends through two lugs on the bracket 33, and the pin is provided with an enlarged head 36 adapted to engage one side of the arm 34. Threaded upon the opposite end of the pin 35 is a nut or knob 37 which can be turned to draw the head 36 against the arm and thus securely clamp the arm in position. In Fig. 1 the dressing mechanism is shown in operative position by full lines and in inoperative position by dotted lines.

The outer lower end of the arm 34 is provided with a horizontal guideway in which is mounted a slide 38 horizontally movable under the control of a screw 39 and a nut 40. Near its rear end the slide 38 is provided with an aperture adapted to receive the reduced end 41 of the aforesaid bolt 29. The part 41 is provided with an annular groove having an inclined wall which is adapted to be engaged by a set screw 42 extending through the slide 38. By tightening the set screw the arm 34 can be securely locked to the bolt 29 and in this way connected with the plate 5 which carries the grinding wheel. In order that the plate 5 and the arm 34 may be rigidly held against any accidental play or lost motion, I prefer to provide means for locking the bar 23 against movement. As illustrated, this means consists of a set screw 43 adapted to engage the bar. When the set screw is thus engaged the bar is prevented from movement and serves to

prevent any transverse movement of the plate 5 or of the arm 34. The clamping of the arm 34 to the bracket 33 by means of the pin 35 and the nut 37, as already described, also assists in preventing such transverse movement. The engagement of the slide 38 with the pin 29 prevents any forward or backward movement of the plate 5 or of the grinding wheel and serves to hold these parts in a forward position with the former pin 27 out of engagement with the former 26.

The arm 34 is provided with a vertical guideway in which is mounted a slide 44 vertically movable under the control of a screw 45 and a nut 46. The slide 44 is provided with a longitudinal horizontal aperture in which is mounted a sleeve 47 provided with an enlarged collar 48 by means of which it may be manually turned. The sleeve 47 can be clamped in any position of adjustment by means of a clamping screw 49. The sleeve 47 is provided with an eccentric aperture in which is rotatably mounted a shaft 50. Connected to or formed integrally with the shaft 50 at its rear end is an offset arm 51 provided with an aperture the axis of which is perpendicular to and in the plane of the axis of the shaft 50. In this aperture is mounted a dressing tool 52, preferably provided with a diamond point. The tool can be held in place by means of a set screw 53 extended through an elongated boss 54. At the front end of the shaft 50 there is connected a hand lever 55 by means of which the shaft together with the arm 51 and the dressing tool 52 can be turned. Connected with the lever 55 is a boss 56 adapted to engage with a stop 57 and thus limit the movement of the shaft 50 to an angle of 180°. The stop 57 is preferably carried by a plate 58 which is pivoted on the shaft 50 and which is held in adjusted position by means of the nut 59 on a screw extending from the slide 44. The plate 58 is provided with a hole for the said screw, which hole is large enough to permit the necessary adjustment of the plate.

The dressing tool must be adjusted to bring its point at the desired distance from the axis of the shaft 50, this distance being, of course, one-half the thickness of the wheel. In order that the dressing tool may be quickly and accurately adjusted, I provide gages of which one is shown at 60 in Fig. 5. The gage can be more conveniently used when the wheel dressing mechanism is in an inoperative position. In Fig. 5 I have illustrated it as swung all the way back. The gage 60 consists of a block having a central aperture adapted to receive the aforesaid boss 54. Projecting from the block are pins 61, 62 of different diameters, so located that their axes can be made to coincide with the axis of the shaft 50. A gage is selected having a pin such as 61 corresponding in diameter to the thickness of the wheel. This gage is put in place, as illustrated, and then the dressing tool 52 is adjusted into contact with the surface of the pin. Inasmuch as the axis of the pin coincides with the pivotal axis of the dressing tool, it will be clear that it is not necessary for the tool to be in any specified angular position. The rock shaft 50 and the arm 51 can be left in any convenient position and the tool simply adjusted into contact with the gage pin. After this adjustment the tool is clamped in place by means of the set screw 53 and the gage is removed.

As has been fully set forth in my aforesaid copending applications, the offset of the wheel through the distance a causes it to engage the edge of each tooth at a plane which is parallel to but separated from the cutter axis. And in order that the cutter may be properly ground without distortion the wheel must be trued at a plane which is at the same distance from the axis.

In order to effect relative adjustment between the grinding wheel 20 and the dressing tool 52, use is made of the aforesaid movable slide 38. It will be seen that when this slide is moved toward the rear it carries the grinding wheel with it, thus moving the axis of the wheel to a position at a distance a from the plane of action of the dressing tool. Preferably there is a scale 63 for indicating the extent of movement of the slide.

These adjustments having been made, the dressing tool is brought into engagement with the wheel by moving the slide 44 by means of the screw 45 and the nut 46. The shaft 50 is rocked slowly back and forth by means of the lever 55, thus swinging the tool 52 in a half-circle and giving the wheel a semi-circular sectional contour in the plane of movement of the tool.

It frequently happens that the diamond point of the dressing tool 52 is somewhat eccentric so that the limits of movement of the tool must be changed as illustrated in Fig. 6. This is effected by loosening the plate 58 and swinging it to one side or the other to thus move the stop 57.

Obviously the axis of the shaft 50 must pass through the central plane of the grinding wheel. However, the position of the grinding wheel will change from time to time, particularly when its bearings wear and have to be taken up. In order to adjust the shaft 50 to bring its axis into exact coincidence with the central plane of the wheel, use is made of the aforesaid eccentric sleeve 47. The clamping screw 49 is loosened as is also the nut 59 which holds the plate 58. Then the sleeve is free to be turned by means of the collar 48 and the shaft 50 can be bodily moved until it is brought into coincidence with the central plane of the wheel. Then the clamping

screw 49 is tightened and also the nut 59, the plate 58 with the stop 57 having been first properly adjusted, as before stated.

What I claim is:

1. The combination with a grinding wheel rotatable about a longitudinal horizontal axis and a supporting means for the wheel, of an arm pivoted to the supporting means at the rear of the wheel, and a wheel dressing tool on the arm bodily movable therewith forward and downward into operative relation with the wheel or upward and backward out of operative relation with the wheel, the said tool being pivotally mounted on the arm for movement about an axis coincident with the central plane of the wheel and intersecting the wheel near the periphery when the tool is in operative relation thereto.

2. The combination of a wheel dressing mechanism comprising a rock shaft having its axis coincident with the central plane of the wheel to be dressed and intersecting the wheel near the periphery, a dressing tool carried by the rock shaft and means whereby the tool may be adjusted relatively to the rock shaft to change the radius of its arc of movement, and a gage adapted to be secured to the dressing mechanism and having a cylindrical pin adapted to be located in alinement with the axis of the rock shaft and to be engaged by the tool to determine the proper position thereof.

3. The combination of a wheel dressing mechanism comprising a rock shaft having its axis coincident with the central plane of the wheel to be dressed and intersecting the wheel near the periphery, a dressing tool carried by the rock shaft and means whereby the tool may be adjusted relatively to the rock shaft to change the radius of its arc of movement, and a gage adapted to be secured to the dressing mechanism and having a plurality of cylindrical pins of different diameters each adapted to be located in alignment with the axis of the rock shaft and to be engaged by the tool to determine the proper position thereof.

4. The combination of a wheel dressing mechanism comprising a rock shaft having its axis coincident with the central plane of the wheel to be dressed and intersecting the wheel near the periphery, a dressing tool carried by the rock shaft and means whereby the tool may be adjusted relatively to the rock shaft to change the radius of its arc of movement, and a gage adapted to be secured to the rock shaft and having a cylindrical pin adapted to be located in alinement with the axis of the rock shaft and to be engaged by the tool to determine the proper position thereof.

5. The combination of a wheel dressing mechanism comprising a rock shaft having its axis coincident with the central plane of the wheel to be dressed and intersecting the wheel near the periphery, a dressing tool carried by the rock shaft and means whereby the tool may be adjusted relatively to the rock shaft to change the radius of its arc of movement, and a gage adapted to be secured to the rock shaft at the end thereof and at the side of the dressing tool opposite from the pivotal mounting of the shaft, the said gage having a cylindrical pin adapted to be located in alinement with the axis of the rock shaft and to be engaged by the tool to determine the proper position thereof.

6. The combination with a grinding wheel and a supporting means therefor, of an arm pivoted to the supporting means, a wheel dressing mechanism on the arm and bodily movable therewith into or out of operative relation with the wheel, the said mechanism comprising a rock shaft having its axis coincident with the central plane of the wheel and intersecting the wheel near the periphery when in operative relation thereto, a dressing tool carried by the rock shaft and means whereby the tool may be adjusted relatively to the rock shaft to change the radius of its arc of movement, and a gage adapted to be secured to the dressing mechanism when out of operative relation to the wheel and having a cylindrical pin adapted to be located in alinement with the axis of the rock shaft and to be engaged by the tool to determine the proper position thereof.

7. The combination with a grinding wheel and a supporting means therefor, of a wheel dressing mechanism comprising a tool pivoted for movement about an axis coincident with the central plane of the wheel and intersecting the wheel near the periphery, means for moving the tool and its pivot at right angles to the axis in accordance with a change in the wheel diameter, means for effecting relative adjustment between the wheel and the tool in a direction parallel to the pivotal axis of the latter and for holding the parts in adjusted relation and means for measuring the extent of such adjustment whereby the wheel can be dressed at a plane separated from its axis by any desired distance.

8. The combination with a grinding wheel and a supporting means therefor, of a wheel dressing mechanism comprising a tool movable through a circular arc of approximately 180° in a plane perpendicular to the plane of rotation of the wheel, a stop for limiting the movement of the tool in both directions and means whereby the stop may be adjusted to change the limits of the movement without varying the extent thereof.

9. The combination with a grinding wheel and a supporting means therefor, of a wheel dressing mechanism comprising a tool pivoted for movement about an axis perpendicular to the axis of the wheel and intersecting

the wheel near the periphery, and means for adjusting the tool and its pivot in parallelism to bring the axis of the pivot into coincidence with the central plane of the wheel.

10. The combination with a grinding wheel and a supporting means therefor, of a wheel dressing mechanism comprising a tool pivoted for movement about an axis perpendicular to the axis of the wheel and intersecting the wheel near the periphery, and means comprising an eccentric sleeve for adjusting the tool and its pivot in parallelism to bring the axis of the pivot into coincidence with the central plane of the wheel.

In testimony whereof, I hereto affix my signature.

BENGT M. W. HANSON.