March 28, 1944. H. THOMASON 2,345,161

BRAKE SHOE GRINDER

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Fig. 1

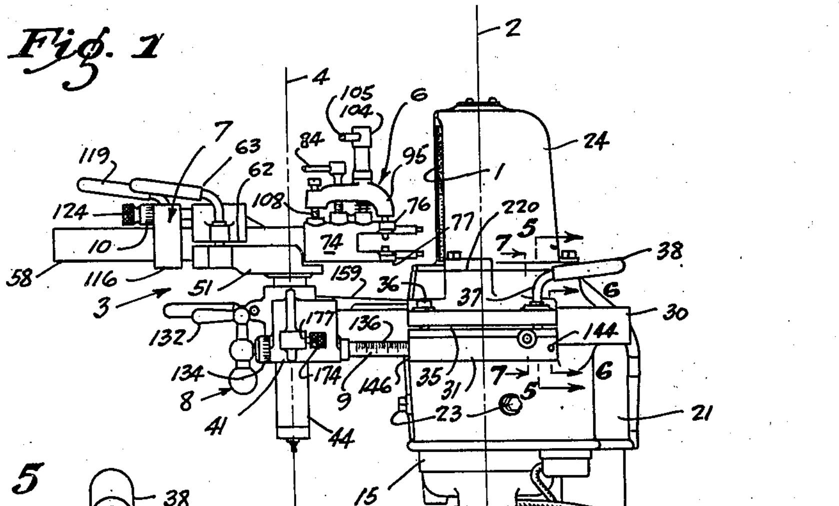
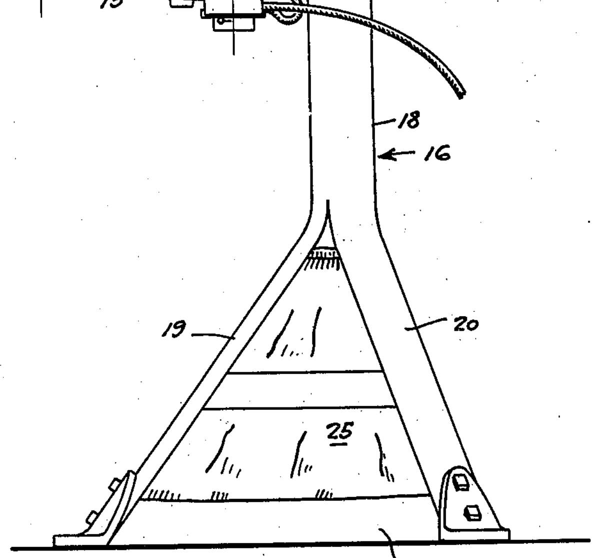



Fig. 5

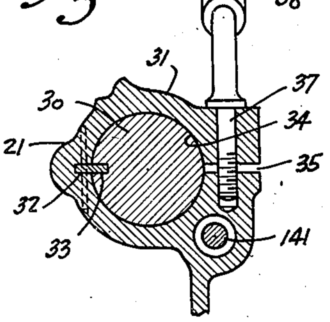


Fig. 6

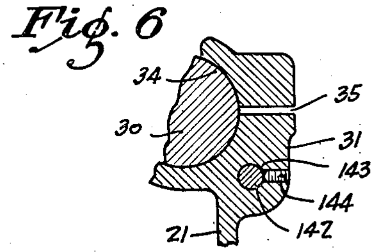
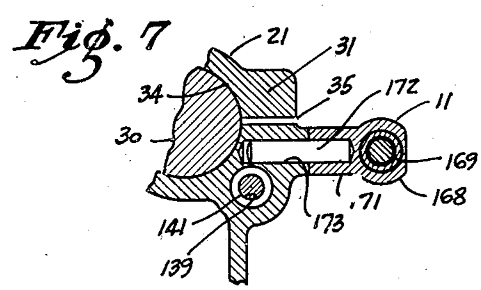


Fig. 7



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BRAKE SHOE GRINDER

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Fig. 2

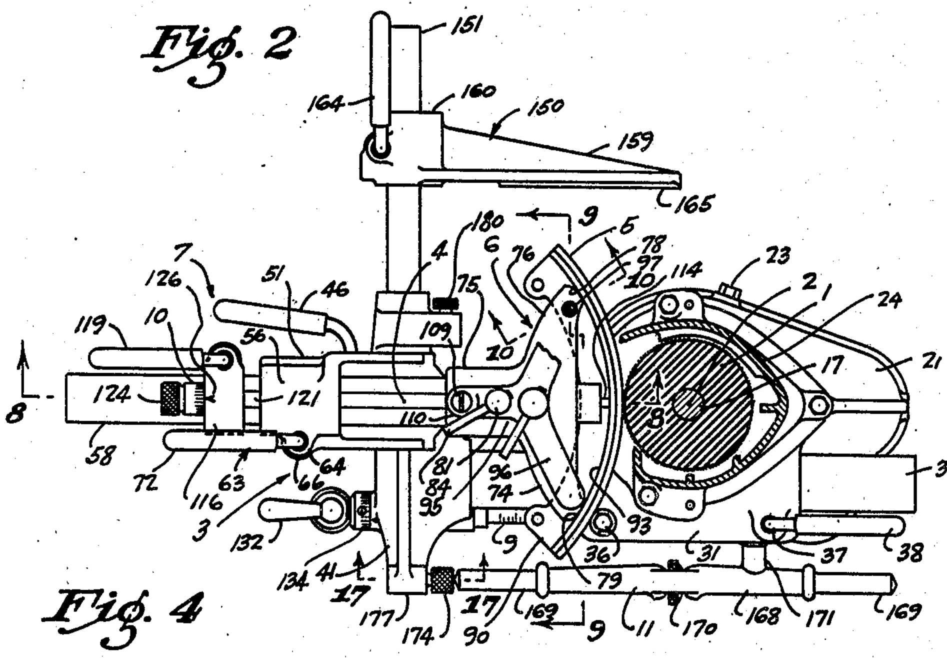


Fig. 4

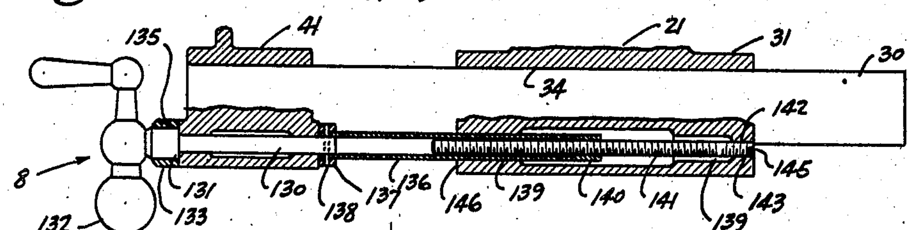
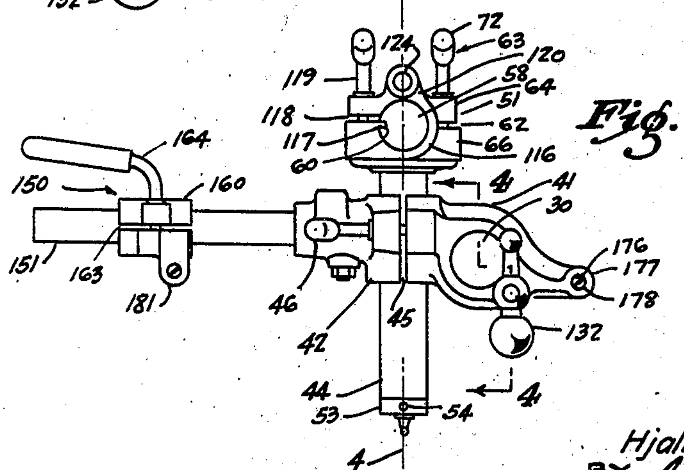


Fig. 3



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BRAKE SHOE GRINDER

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Fig. 8

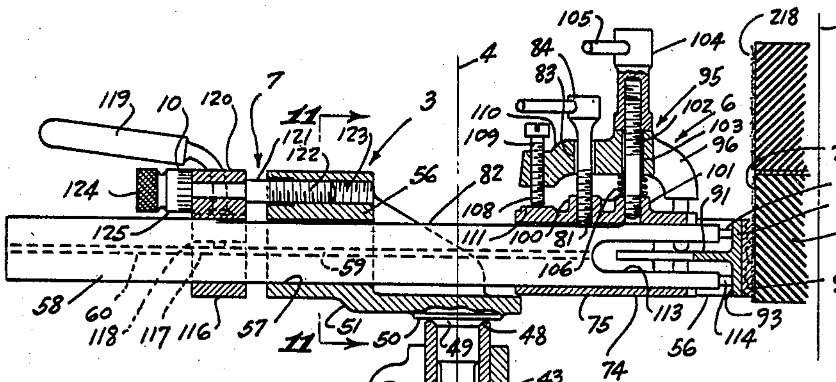


Fig. 10

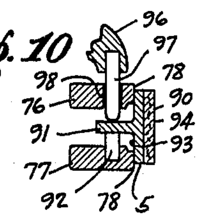


Fig. 11

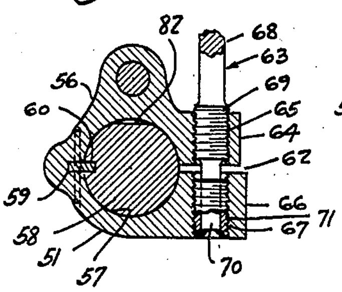


Fig. 9

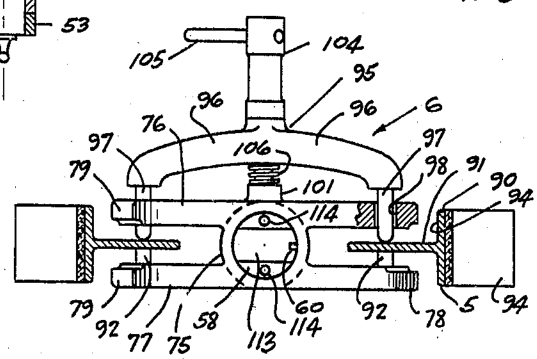


Fig. 15

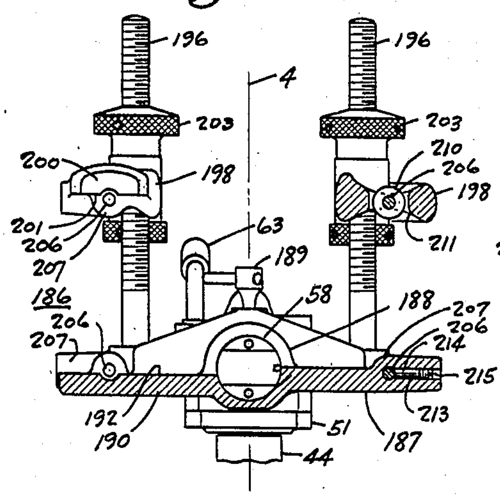
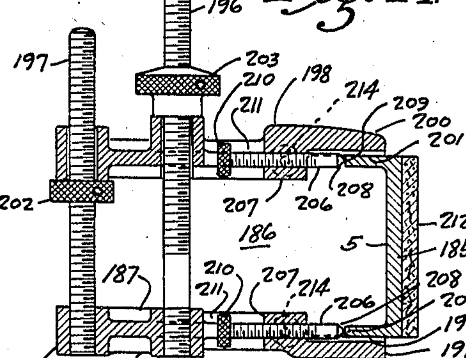


Fig. 14



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BRAKE SHOE GRINDER

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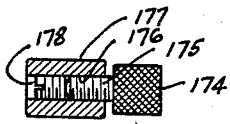


Fig. 17

Fig. 13

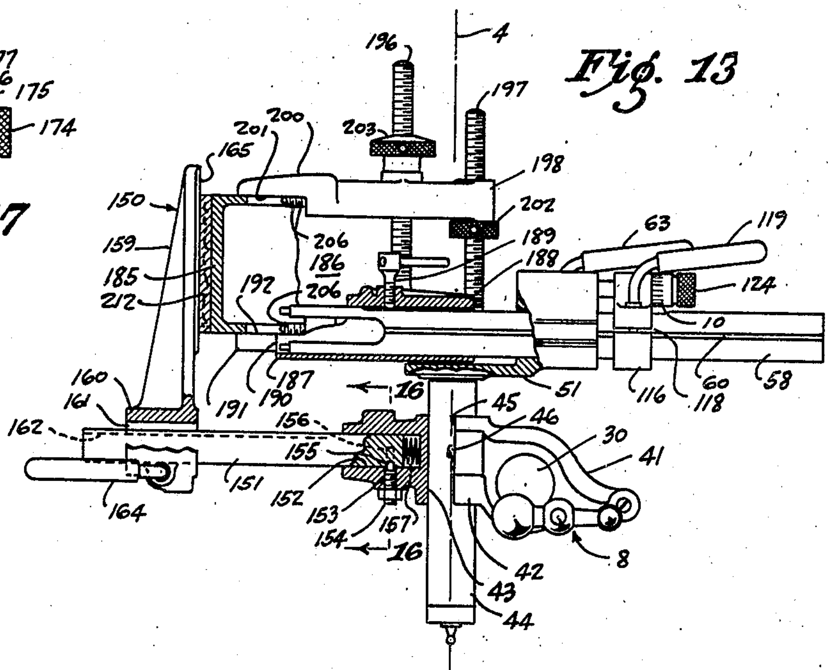


Fig. 16

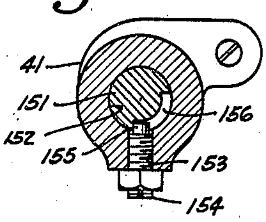
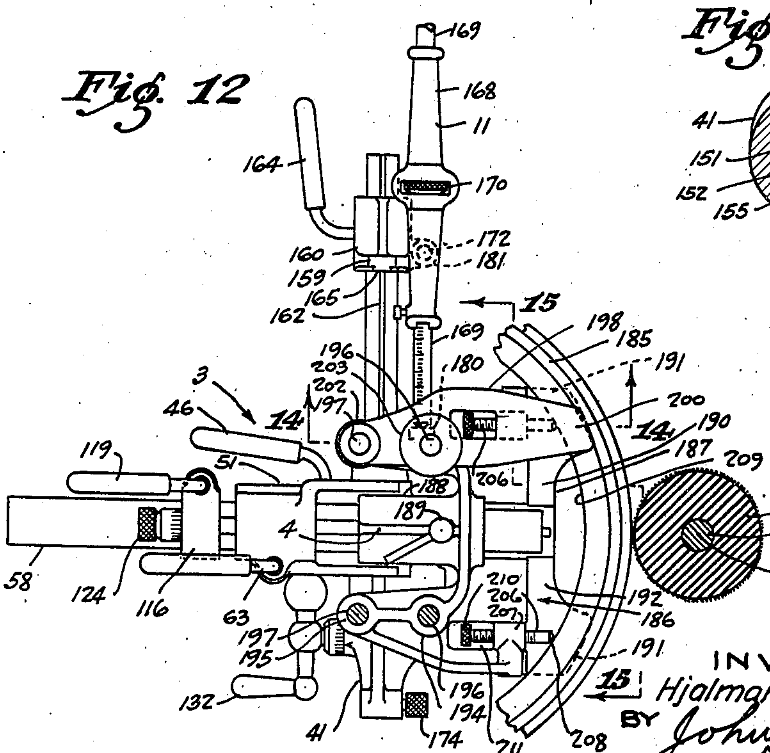


Fig. 12



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Patented Mar. 28, 1944 2,345,161

UNITED STATES PATENT OFFICE

2,345,161

BRAKE SHOE GRINDER

Hjalmar Thomason, Los Angeles, Calif.

Application June 30, 1941, Serial No. 400,417

7 Claims. (Cl. 51—96)

This invention relates to apparatus for grinding or machining arcuate surfaces; more particularly it relates to a machine for grinding or machining the wearing surfaces of the brake shoes of automotive vehicles or the like.

In modern automobiles, trucks and such vehicles, efficient braking is highly important, and this requires among other things, that the braking surface of the brake shoes have a curvature accurately agreeing with that of the cooperating surface of the brake drum. It is accordingly an object of this invention to provide a machine capable of guiding a brake shoe with a high degree of precision.

In such grinders, it has been common to provide a grinding wheel with a stationary axis, and to urge the convex side of the brake shoe against the wheel. It is an object of this invention to ensure accuracy in grinding in this manner, by providing a rigid support for the shoe, and an axis about which the shoe support may be oscillated in a direction transverse to the grinder axis.

It is another object of this invention to improve such apparatus by providing means whereby the position of the shoe along said axis may be altered, making it possible to use any desired portion of the surface of the grinding roll.

It is still another object of this invention to make it possible to accommodate a variety of sizes of shoes in an effective manner. One difficulty that often arises is that a firm grip upon the shoe for holding it against the grinding surface may cause the shoe to be sprung from its normal unstressed position, and after the grinding operation is performed, and the grip relaxed, the grinding surface departs from the true cylindrical form desired. It is another object of this invention to make it possible to clamp the shoe firmly without springing or warping it; and capable of adjustment to take care of different radii of curvature of the shoe.

It is still another object of this invention to provide such a clamp which is capable of firmly gripping and supporting a brake shoe even though it is deformed or of irregular outline and shape.

It is a still further object of this invention to provide a check gauge for such apparatus, whereby the braking surface may be checked at any time during the grinding operation, and by which the shoe can be checked if desired before the brake lining is applied.

It is still another object of this invention to provide such apparatus wherein a gauge used to determine the diameter of the brake may be used directly to set the machine to grind the required radius of the arc.

This invention possesses many other advantages, and has other objects which may be made more easily apparent from a consideration of several embodiments of the invention. For this purpose there are shown a few forms in the drawings accompanying and forming part of the present specification. These forms will now be described in detail, illustrating the general principles of the invention; but it is to be understood that this detailed description is not to be taken in a limiting sense, since the scope of the invention is best defined by the appended claims.

In the drawings:

Figure 1 is a side elevation of the machine;

Fig. 2 is a plan view thereof, partly in section;

Fig. 3 is an elevation of the work carriage, as seen from the left side of Fig. 1;

Fig. 4 is a detail section as seen on plane 4—4 of Fig. 3;

Figs. 5, 6 and 7 are fragmentary sections on an enlarged scale taken along correspondingly numbered planes of Fig. 1;

Fig. 8 is a transverse section on an enlarged scale, taken along plane 8—8 of Fig. 2;

Fig. 9 is an elevation partly in section on an enlarged scale, taken along plane 9—9 of Fig. 2;

Fig. 10 is a detail section taken on plane 10—10 of Fig. 2;

Fig. 11 is a section on an enlarged scale taken on plane 11—11 of Fig. 8;

Fig. 12 is a view similar to Fig. 2 but showing a modified form of the invention;

Fig. 13 is a view similar to Fig. 3, but showing the modified form of work carriage of Fig. 12 in an alternate position;

Figs. 14 and 15 are sections on an enlarged scale taken on correspondingly numbered planes of Fig. 12;

Fig. 16 is a detail section taken on plane 16—16 of Fig. 13; and

Fig. 17 is a detail section taken on plane 17—17 of Fig. 2.

Referring to Figs. 1, 2 and 8 of the drawings, it will be seen that the machine comprises a grinding wheel, such as roll or cylinder 1 rotated about an axis 2, shown as vertical, and a work supporting carriage 3 supported so as to be rotatable about an axis 4, parallel to axis 2, and spaced therefrom. While an abrasive roll is shown, the term "rotary cutting wheel" as used herein is meant to apply as well to machining rollers or millers or cutters, for example such as "Carbaloy" rollers. Carriage 3 supports a brake shoe 5

(Fig. 2) which is intended to be ground, by means of a clamp structure 6. Means are provided to accurately position axis 4 with respect to axis 2 and the surface of the grinding roll 1. Thus by oscillating carriage 3 and shoe 5 about the carriage axis 4, the surface of shoe 5 is ground or machined to the desired radius, having a center on axis 4. A mechanism 7 is provided for advancing the shoe 5 against the surface of the guiding roll 1 without altering the position of axis 4. Thus any necessary amount may be removed from the surface of shoe 5, at the same time this surface will always have the desired radius as determined by the relative positions of this axis 4 and the grinding surface of cylinder 1.

The means 8 for positioning the carriage 3 may have suitable indicia 9 (Fig. 1) for indicating the radius to which shoe 5 will be ground. Also the means 7 may have indicia 10 (Fig. 8) for directly indicating the amount to be ground from the shoe. An arrangement is also provided whereby a pin gauge or inside caliper 11 (Fig. 2) which has been adjusted to the inside diameter of the brake drum with which shoe 5 is to be used may be utilized directly to position the carriage 3, without the need of transferring measurement accompanied by possibility of errors.

Referring in more detail to the structure, an electric motor 15 (Fig. 1) is mounted on a suitable frame 16 so that its shaft 17 (Fig. 2) extends vertically, the axis of shaft 17 coinciding with axis 2. Frame 16 may be conveniently formed of a piece of wrought iron pipe or steel tubing 18 of appropriate size and length having its lower portion divided longitudinally and opened out to form supporting legs, two of which are indicated by numerals 19 and 20 (Fig. 1) and which serve to support the structure in a vertical position. The upper end of tube 18 has a casting 21 secured thereon in any convenient manner. This casting 21 has a lower depending hollow portion, into which the frame of motor 1 is telescoped. Casting 21 is provided with set screws 23 which engage the motor stator, and clamp it firmly in the lower portion of the casting. A socket for the top of pipe 18, offset from axis 2 is also provided in casting 21. The casting may be firmly held on the pipe 18 as by clamping screws, not shown.

Motor shaft 17 extends upwardly out of casting 21 and has grinding roll 1 secured thereon in any appropriate manner. A hood or shroud 24 is mounted on the top plane surface 220 forming a flange on casting 21. This shroud substantially surrounds roll 1, leaving only a portion of its periphery exposed for contact by the surface to be ground (see Fig. 2). Means (not shown) are provided within casting or frame 21 to create a suction in shroud 24 so that all loose abrasive, dust, etc., incident to the grinding operation are drawn into the shroud 24, and thence delivered downwardly through pipe 18 into a dust bag 25, having a detachable bottom or pan 26 encompassed by the legs 19, 20 of stand 16.

The axes 2 and 4 may be maintained in spaced relation, to determine the radius being ground, by the aid of a supporting structure that includes a supporting bar or spindle 30. This bar has an axis transverse to axes 2 and 4 (Figs. 1, 2 and 4), and spaced from them. The bar 30 is slidably supported by a long boss 31 formed on casting 21, at one side of axis 2. Bar 30 may be conveniently of circular cross section (Figs. 5, 6 and 7). A key 32 (Fig. 5) fixed in boss 31 engages a keyway 33 in bar 30 and serving to prevent bar 30 turning about its axis. Bore 34 of boss 31 is intersected by a central, axially extending cut 35, which extends the full length of boss 31. By providing means adapted to close the boss 31 about the bar 30, as for example the cap screw 36 (Fig. 1) and clamping screw 37 (Figs. 1, 2 and 5) adjacent the ends of the boss, bar 30 may be effectively restrained against axial movement. Thus by appropriately tightening one of these screws such as 37, the bar 30 may be clamped in adjusted position. To facilitate such clamping and the freeing of bar 30 for subsequent movement, screw 37 may be provided with a handle 38. Screw 36, after initial adjustment, remains unchanged, and is used only for taking up any looseness between bar 30 and its guide boss 31.

The outer end of bar 30 has secured thereon, a supporting member 41 (see Figs. 1, 2, 3, 8 and 13) which serves to support carriage 3 for angular movement about axis 4, as well as adjustment along this axis. For this purpose, bar 30 is positioned in a cylindrical bore in member 41 and is securely fastened thereto as by one or more radial set screws passing through the member 41. Member 41 may conveniently be a casting having a hub 42 with a bore 43 therethrough whose axis coincides with axis 4, and has a tube 44 slidable therein. Hub 42 has a radial, axially extending slot 45 intersecting bore 43, and is arranged to be clamped about tube 44 to prevent movement thereof by a clamp screw 46. This clamp screw 46 is of novel form and so arranged as to clamp the hub 42 about tube 44 in response to rotation in one direction, and to positively open the hub 42 upon rotation in the opposite direction. Thus, there is no possibility of the hub 42 freezing about tube 44, and it is always possible to move this tube readily when required. This arrangement will be described in more detail in connection with another part of the apparatus.

As shown most clearly in Fig. 8, tube 44 serves to provide a support for mechanism 3 angularly movable about axis 4 of this tube. For this purpose tube 44 is used as a journal bearing. Thus the upper face of tube 44 has a conical seat 48 formed thereon. A corresponding surface 49 of a hub 50 formed on the under side of the carriage supporting or swivel bracket 51 rests therein. Bracket 51 has a depending spindle or shank 52, which has ends closely fitting into the bore of tube 44, but is freely rotatable therein. A collar 53 is secured on the lower portion of shank 52, as by a set screw 54 and serves to prevent upward movement of shank 52 in tube 44.

The arrangement is such that, due to conical surfaces 48, 49, bracket 51 is confined accurately to rotate about axis 4, such rotation being unrestrained. At the same time, bracket 51 may be adjusted axially of axis 4, by raising and lowering tube 44 in hub 42. The bracket 51 is secured in adjusted position by suitable manipulation of clamp 46.

Bracket 51 has an upstanding rear portion or wall 56 (Figs. 2 and 8) with an opening 57 through which slides a bar 58. The axis of this bar is normal to axis 4, and intersects this axis. Bar 58 may be a round shaft (Fig. 1). A key 59 secured in wall 57 and engaging a keyway 60 in bar 58, prevents the bar turning in bracket 51. The rear portion 56 of bracket 51 also has an axially extending split 62, and a clamp screw 63 is provided to tighten bore 57 about bar 58 and prevent movement thereof. This clamp screw 63 is of that type previously mentioned, wherein rotation in one direction serves to clamp the bored member as 56 around the shaft as 58, while rotation in the opposite direction serves to positively spread the member 56 and free the shaft. By operation of clamp 63, it is possible to adjust the bar 58 in the guide 56 and to hold it in any desired position.

Referring to Fig. 11, wall 56 has a boss or ear 64 above cut 62 with a threaded opening 65 therein, and has a similar boss 66 below cut 62 with a threaded opening 67 therein. The threads in openings 65, 67 are of opposite hand. Thus, the thread in opening 65 may be right hand, while that in opening 67 is left hand, or vice versa. The manner in which the clamp 63 is made and assembled will now be described.

The clamp screw 63 is formed of a rod 68 having a short threaded portion 69 spaced from an unthreaded end portion 70 of reduced diameter. Threaded portion 69 engages the threads of opening 65. The length of reduced portion 70 is somewhat more than the thickness of ear 66 plus the width of slot 62. The rod 68 is threaded into bore 65 until the lower end of the rod is adjacent the lower end of bore 67. A sleeve 71 with a smooth bore and an external thread that is of the opposite hand as compared with the threads on portion 69 is then threaded into bore 67 and over reduced portion 70, until the upper end of the sleeve is a short distance below slot 62. Sleeve 71 is then secured to portion 70 as by arc welding. The upper portion of rod 68 is then bent over to form a radially extending handle 72. Rotation of clamp screw 63 will positively urge bosses 64 and 66 in opposite directions, either together or apart depending on the direction of such rotation. The clamp screw 63 cannot be removed after assembly except by severing the portions 69 and 70—71 as by a saw inserted in slot 62, or by removing sleeve 71 from portion 70.

The right hand end of bar 58 carries the brake shoe clamping means 6, whereby it is possible, by longitudinal adjustment of bar 58, to move the shoe 5 toward or from the grinding surface of wheel 1. The clamping means 6 comprises a supporting member 74 (Figs. 1 and 2) having a central hollow hub 75 that permits the means 6 to slide upon bar 58. A pair of spaced parallel arms 76, 77 extend from one end of the hub transversely of the bar and respectively above and below its center (see Figs. 1, 2 and 9). The ends of these bars are provided with similar convexly curved surfaces in a horizontal plane, as indicated at 78, 79.

Member 74 is axially adjustable of bar 58. A screw 81 (Figs. 1, 2 and 8) secures the member 74 in adjusted position. Bar 58 has a flattened portion 82 (Fig. 8), which cooperates with screw 81 to angularly position the member 74 on the bar.

A type of automobile brake shoe in common use has a generally T-shaped section; such a shoe is shown at 90 in Figs. 2, 8, 9 and 10. The leg 91 of the section is intended to be accommodated between legs 76 and 77 of the clamp, being supported approximately midway between them on pins 92, near the ends of the lower arm 77. The inner curved surface 93 of shoe 90 rests against arcuate surfaces 78, 79 (Fig. 1). Brake shoe 90 is shown as having brake lining 94 on its outer surface, and it is this lining that it is desired to grind.

Such brake shoes are often of relatively light material and it is important that the clamping arrangement be such as to not deform or spring them. Further, it is important that the shoe be adequately supported so that the forces incident to the grinding operation will not deform or flex the shoe. A clamp fulfilling these requirements will now be described.

As a means of retaining shoe 90 on supporting member 74, a frog 95 (Figs. 1, 2, 8, 9 and 10) is mounted thereon having oppositely extending arms 96 with pins 97 in their extremities. These pins 97 pass through clearance holes 98 in arm 76 and are alined with pins 92. By exerting downward pressure on frog 95, relative to member 74, leg or web 91 of shoe 90 is clamped between pins 97 and 92.

Hub 75, mounted on the right hand edge of bar 58, has a series of three bosses on its upper surface, the center one of which, indicated by 100 (Fig. 8) is tapped for set screw 81 which passes upwardly through clearance hole 83 in frog 95, provided with a handle 84 for convenient manipulation. The forward boss 101 is tapped to receive a special stud 102 which passes upwardly through a clearance hole 103 in frog 95 and carries a sleeve nut 104 at its upper end. Sleeve nut 104 has a handle 105 for convenient manipulation, the arrangement being such that when nut 104 is screwed downwardly frog 95 is forced downwardly and pins 97 are clamped against web 91 and toward pins 92. A light compression spring 106 is confined about stud 102 between frog 95 and boss 101, to raise the frog as soon as the pressure of nut 104 is released, facilitating removal of shoe 90.

Frog 95 is arranged so that pressure exerted by nut 104 causes the frog to swing downwardly about a fulcrum 108, whereby the force is transferred from nut 104 to pins 97. To ensure that these pins 97 are moved in a substantially vertical direction when they are exerting a clamping force on web 91, regardless of the thickness of web 91, fulcrum 108 is made adjustable in height. Thus, it may comprise a screw 109 threaded in a rearwardly extending arm 110 on frog 95. The point of this screw is adapted to rest on pad or boss 111 on hub 75. By adjusting screw 109 in the arm 110 the effective height of fulcrum 108 is altered.

Since the arcuate concave surfaces of the shoe are contacted effectively by the surfaces 78, 79, the shoe can resist any reasonable flattening force occasioned by the grinding operation. Also, pins 97 need not all engage in a common plane, and if flange 91 of shoe 90 is warped, these pins can accommodate themselves to that condition. This is due to the fact that frog 95 has sufficient clearance with respect to screw 81, and therefore frog 95 is free to tilt within limits. Furthermore, the lower ends of pins 97 are purposely made convex to restrict the area of contact with flange or rib 91.

The right hand end of bar 58 has a deep diametral slot 113 for accommodating web 91. The face of the bar 58 has horizontal projections or pins 114 above and below the slot. Supporting member 74 is axially adjusted on bar 58 until pins 114 contact the inner surface 93 of shoe 90, the member 74 then being secured in this position by means of set screw 81 (see Fig. 2). By this means, shoe 90 is adequately supported to prevent any flexing or temporary deformation during grinding; at the same time, no force is exerted on the shoe by the clamp to cause deformation of the shoe.

Means 7 is used for advancing bar 58 with respect to bracket 51 during the grinding operation, so as to cause brake shoe 90 to approach the grinding surface 1. This means includes a ring or collar 116 (Figs. 2, 3 and 8) mounted on bar 58 so that the bar may slide through it. This collar is located just behind bracket 51. Collar 116 has a key 117 (Fig. 3) engaging keyway 60 in bar 58 to prevent angular movement of the ring about the bar, and is also split as at 118. A clamp screw 119 substantially identical with clamp screw 63 of bracket 51 serves to clamp or release collar 116 with respect to bar 58.

Clamp 116 has an upward projection 120 in which is rotatably mounted rod 121 (Fig. 8). Means are provided to prevent axial movement of rod 121 through projection 120. Rod 121 has an enlarged threaded end 122 engaging a suitably threaded opening 123 in wall 56 of bracket 51. The rear end of rod 121 carries a knurled operating knob 124 having an extension 125 carrying the appropriate indicia 10 which cooperates with an index mark 126 (Fig. 2) on projection 120. When it is desired to feed rod 58, clamp 6, etc., toward the grinding roll 1, clamp 63 is loosened to free rod 58 from bracket 51, and clamp 119 is tightened to secure ring 116 on the shaft 58. Rotation of knob 124 in the correct direction will then cause collar 116 to approach bracket 51, moving shaft 58 through it, the amount of movement being indicated by scale 10. Obviously rotation of knob 124 and shaft 121 in the opposite direction will retract clamp 6 together with the shoe 90 from the grinding roll 1.

While the screw 122 serves to feed the shoe toward or from the grinding roll 1, this feed occurs while axis 4 is fixed with respect to axis 2. Accordingly the radius of grind as determined by the spacing of axes 2 and 4 may be adjusted only if the position of axis 4 is adjusted. For this purpose the position of the swivel bracket 51 is made adjustable by means best illustrated in Figs. 4 and 6.

The hub of member 41 fastened to bar 30 rotatably supports a short shaft 130. This shaft 130 has an axis parallel to and below the axis of bar 30. Shaft 130 has an enlarged left hand end 131 serving to form a shoulder and having an operating handle 132 fixed thereon as well as a collar 133 adjustably secured thereon, as by set screw 135. Scale marks 134 on collar 133 cooperate with a stationary index mark on the hub member 41.

The right hand end of shaft 130 has a tube or sleeve 136 as well as a thrust collar 137 secured thereon as by a pin 138. Tube 136 enters a suitable bore 139 in hub 31 formed integrally with casting 21. The free end of tube 136 has a portion 140 of reduced internal diameter and provided with screw threads which engage a suitably threaded rod 141 (see also Figs. 6 and 7). This rod 141 is mounted coaxially in bore 139 and adjustably held against axial movement therein by having its right hand extremity 142 threadedly engage a portion 143 of bore 139 of reduced diameter. For ease of adjustment as will be presently set forth, the threads on 142 securing the rod 141 in place may be of the opposite hand to the threads engaged by sleeve 136. A set screw 144 serves to secure rod 141 in adjusted position (Figs. 1 and 6).

Rotation of sleeve 136 by means of handle 132 on the fixed threaded rod 141 will cause the sleeve to move axially of the rod, and thus member 41, bar 30 and attached parts will move toward or from the axis 2 of the grinder depending on the direction of the threads on rod 141 and the direction of rotation. By providing a fixed threaded rod 141 enclosed by a sleeve 136, the threads are protected from dust and grit, and it is much easier to provide proper lubrication. Further, the outside of the sleeve 136 forms a convenient surface for scale marks 9. These marks cooperate with the face 146 (Figs. 1 and 4) of hub or boss 31 as an index, and together with the indicia 134 on collar 133 serve to accurately position the axis 4 of carriage 3 with respect to axis 2 of the grinding roll 1.

The position of carriage 3 with respect to hub 31 and index 146, is made adjustable, in a manner supplemental to rotation of handle 132. During this adjustment, handle 132 need not be rotated; thus the marks of scale 9 may be first angularly adjusted by handle 132 so that they appear on the upper portion of sleeve 136 and hence in a position to be readily observed when in registry with the index. Therefore by aid of this supplemental adjustment, it is possible first to bring the carriage 3 to an approximately correct position by aid of handle 132, the graduations 9 being visible; then a fine setting is accomplished without moving the handle further.

The means whereby this is accomplished will now be described. As previously noted that portion 142 (Fig. 4) of threaded rod 141 which serves to secure this rod in hub 31 has threads of the opposite hand with respect to the threads engaged by sleeve 136. Rotation of rod 141 in its support 143 will not only cause the rod 141 to move relative to the support 31, but will also cause sleeve 136 to move on the rod 141. Thus, by placing sleeve 136 with scale 9 in the desired angular position, rotation of rod 141 will serve to move sleeve 136 and connected parts to bring axis 4 into a relationship with the surface of the grinding roll 1 as indicated accurately by scale 9. Rotation may be conveniently imparted to rod 141 by loosening set screw 144 and applying a screw driver to kerf 145 in the end of the rod. After adjustment, set screw 144 is again tightened to prevent further rotation of rod 141.

To cause the scale 9 to be always in the chosen visible angular position when any mark thereon is in registry with the index 144, the spacing of the scale marks 9 should be an even multiple of the pitch of those threads of rod 141 which engage the sleeve 136. Further, it is not necessary that the threads on the supporting end 142 be of the opposite hand to those of the rest of the rod 141; if they are of the same hand but of different pitch, the same result will be achieved.

As a means of checking the surface of the brake lining 94 after grinding, both for alinement and radius, as well as checking shoe 90, before the lining is applied, for warping or distortion, a check gauge mechanism 150 is provided (see Figs. 2, 3, 12 and 13). This mechanism is such that it provides a gauging surface adapted to cooperate with the lining or the shoe when swung sufficiently away from the grinding wheel 1 about the axis 4.

A cylindrical guide bar 151 (Figs. 2, 3, 13 and 16) is rotatably mounted in a bore 152 in member 41 having its axis horizontal and perpendicular to axis 4. These two axes intersect. Means are provided to prevent axial movement of bar 151 with respect to member 41 as well as to limit its angular movement (see Figs. 13 and 16). Bore 152 is intersected by a tapped radial hole 153 in which is mounted a set screw 154 having a plane cylindrical end portion 155. This portion 155 engages a circumferential groove 156 formed near the end of bar 151 and by engaging the sides of the groove prevents axial movement of the bar. As clearly shown in Fig. 16, groove 156 is of limited angular extent. The ends of the groove by respectively engaging the end 155 of set screw 154 limit the rotation of bar 151 to approximately 90°. A compression spring 157 confined between the end of bar 151 and the bottom of bore 152 frictionally restrains rotation of the bar, and also ensures that one side of groove 156 will be in contact with the cylindrical end 155 of screw 153.

Slidably mounted upon bar 151 is a gauging arm 159 having a bored hub 160 through which bar 151 passes. To prevent arm 159 rotating on bar 157, hub 160 is provided with a key 161 (Fig. 13) engaging an axially extending keyway 162 in bar 151. Hub 160 is split on one side as indicated at 163 in Fig. 3 and is provided with a clamp screw 164 incorporating a right and left hand thread to positively open as well as close the hub, as previously discussed. Arm 159 has an accurately finished plane surface 165 relatively long and narrow, which is parallel with the plane passing through axes 2 and 4; and normal to the axis of bar 151. This surface acts as a gauging surface. Arm 159 is so positioned on bar 151 with respect to the limiting slot 156 that it may be turned with bar 151 to occupy either the horizontal position of Figs. 1, 2 and 3 where it is out of the way when not in use, or the vertical position of Figs. 12 and 13 ready for use.

It is apparent that scales 9 and 134 may be used to accurately position axis 4 with respect to the grinding roll 1, scale 9 being preferably graduated in terms of the diameter of the brake drum. Thus for a given scale setting, say 14″ drum diameter, the axis 4 will be half this amount, or 7″ from the grinding surface, and the braking surface will be ground to this radius. Then, a shoe, as 90 placed in the clamp 6 and moved into contact with the grinding surface by the screw mechanism 121, 124 will when swung about axis 4, have the surface of brake lining 94 ground to the predetermined radius, or drum diameter.

The movement of shoe 90 towards the grinding roll 1 by means of screw feed 121, 124 obviously has no effect whatever on the radius to which the shoe will be ground, since this is determined by the position of axis 4.

However, it is common to grind shoes to fit existing brake drums, which involves determining the diameter of such drums. It is of great convenience to use the gauge with which such diameter has been measured to directly position the axis 4 at the proper distance from the grinder 1 without the necessity of reading any measurements.

In Fig. 2, a gauge for determining the inside diameter of a brake drum is indicated by 11. Such a gauge is shown and described in a copending application entitled "Adjustable pin gauge" and filed in the name of Hjalmar Thomason on December 27, 1938, under Serial No. 247,774. The gauge 11 comprises a body portion 168 carrying oppositely extensible gauging pins 169 arranged for simultaneous inward or outward movement by rotation of a knurled knob 170. Suitable indicia may be provided for accurately indicating the distance between the points of pins 169. However, as previously mentioned, no reading of such indicia is required in the present arrangement, the setting of pins 169 being used directly to set the swivel bracket 51 with respect to the grinder 1. Thus, the gauge body 168 has a boss 171 carrying a pin 172 having an axis located at a definite relationship with respect to the center of gauge 11, and normal to the axis of the gauging pins 169.

Body 21 of the grinded has an appropriately positioned hole 173 (Fig. 7) for receiving pin 172. Further, member 41 has a hardened steel button 174 (Figs. 1, 2, and 17) so positioned that its hardened plane face contacts the end of gauge pin 169 when the gauge 11 is in a horizontal position. The relative locations of hole 173, button 174, axes 2 and 4, and the grinding surface of roll 1 are such that with the face of button 174 contacting the end of pin 169 when gauge 11 is supported in hole 173, axis 4 will be properly positioned for shoes to be ground to the diameter for which gauge 11 is set. The interior cylindrical surface of hole 173, and the surface of button 174 thus form cooperating gauging surfaces.

To provide for variations in the diameter of grinding rolls, due to initial variations of wear, button 174 is adjustable in member 41 so that the position of its face with respect to axis 4 may be altered. Thus (see Fig. 17) button 174 has a threaded shank 175 engaging an appropriately threaded aperture 176 in boss 177 on member 41. A screw 178 in aperture 176 serves to lock button 174 against movement.

Gauge 11 may also be used to position gauge check arm 159, as shown in Fig. 2. Member 41 carries another button 180, similar to button 174 and adjustable in the same manner. Also boss 160 of arm 159 has an ear 181 (shown dotted behind gauge 11 in Fig. 12) with an aperture for receiving pin 172 of gauge 11. Thus with arm 159 in its vertical position gauge 11 may be mounted on hub 160, and arm 159 moved axially of bar 162 until button 180 contacts the end of pin 169. The parts are so proportioned and arranged that when this is done and using the short end of the gauge 11, face 165 of arm 159 will be at a distance from axis 4 equal to half the diameter set on the gauge, or the radius to which the shoe is to be ground.

Although Figs. 12 and 13 illustrate a modified form of clamp for accommodating a wider brake shoe, the setting and use of the check gauge 150 is the same as with a narrow shoe. Thus with the check arm 159 properly positioned the work carriage 3 may be swung about axis 4 bringing the face of the supported brake shoe into juxtaposition with face 165 of arm 159, making it possible to check the radius as well as the alinement, and other characteristics of the face. Further, by setting arm 159 and mounting the brake shoe on the carriage before applying the lining, it is similarly possible to check the shoe for size, deformation and other defects.

The brake shoe 90 discussed in connection with Figs. 2, 8 and 9 is of the type usually used on pleasure cars or light trucks. Heavier vehicles use a much wider shoe as indicated by 185, in Figs. 13 and 14. Such a shoe requires a different type supporting clamp from that disclosed in connection with shoe 90, and such a clamp is generally indicated by 186 in Figs. 12, 13, 14 and 15.

Clamp 186 is interchangeable with clamp 6, and is intended to be mounted on bar 58 in a similar manner. Thus, clamp 186 includes a lower plate-like member 187 (Fig. 15) having a hub 188 with a bore for receiving bar 58, and a set screw 189 (Figs. 13 and 15) for securing the clamp in adjusted position, the same as supporting member 74 of clamp 6.

Lower member 187 has a forwardly extending shelf 190 with horns or projections 191. The shelf 190 and these horns have a plane upper surface 192 upon which the lower flange of brake shoe 185 is supported (see Fig. 14). Member 187 has also a pair of rearward extensions 193, disposed respectively on opposite sides of hub 188. Each extension 193 has a pair of threaded bosses 194, 195, carrying respectively upstanding threaded rods 196, 197. Slidable over each pair of rods 196, 197 is an upper clamp member 198. Upper clamp members 198 are duplicates except for being right and left hand. Each includes a forward projection or horn 200 having an under surface 201 adapted to engage an upper surface of the top flange of shoe 185. As a means of supporting the rear end of member 198, a knurled nut 202 is provided on threaded rod 197. Another knurled nut 203 is provided on threaded rod 196, and is adapted by being screwed downwardly on the rod to swing member 198 downwardly about nut 202 as a fulcrum, urging surface 201 against shoe 185, thus confining the shoe 185 between surfaces 192 and 201.

As in the first form of clamp described, the upper clamp members 198 can freely accommodate themselves to the corresponding flange surface, even if the surface be warped. This is due to the independent operation of the two clamping nuts 203 and the clearances between studs 196 and the apertures through the clamp elements.

In case shoe 185 can not be clamped in the above described manner with sufficient force to hold the shoe against radial movement while being ground, means are provided to positively support the shoe from the rear of the shoe.

Thus, each of the horns or projections 191, 200 carries a supporting screw 206 threadedly supported in a boss 207 on the respective horn. The forward end of each screw 206 is coned as indicated by 208 to provide a point contact with a rear surface 209 of shoe 185. The rear end of each screw 206 has a knurled adjusting knob 210 accommodated in a suitable opening 211 in the clamping member.

To prevent undesirable looseness of screws 206, each of hubs 207 has a radial hole 213 (Fig. 15) containing a slidable soft metal plug 214. The outer end of hole 213 is threaded for a headless set screw 215. By screwing set screw 215 inwardly, plug 214 is forced against screw 206 and exerts an adjustable amount of frictional restraint against rotation of the screw 206.

It will be apparent that by appropriate adjustment of screws 206 the outside surface 212 of shoe 185 may be correctly located with respect to axis 4 and grinding roll 1 regardless of irregularities in the rear surface 209 of the shoe; further that arms 191 and 200 cooperate with screws 206 to firmly secure shoe 185 in clamp 186; at the same time no force is exerted on shoe 185 tending to cause distortion.

The grinding operation and use of check arm 159 are the same with clamp 186 and a wide shoe 185, as with clamp 6 and a narrow shoe 90.

An important feature of the machine is the provision for adjustment of the work carriage including the swivel bracket 51, shoe clamp 6 or 186 together with the supported brake shoe in a vertical direction along axis 4. By this adjustment it is possible to bring the brake shoe into contact with different zones on the grinding roll 1, thus rendering the entire surface of the roller useable. This prolongs the useful life of the roll, and also makes possible the use of a grinding roll having zones of different grinding characteristics. Thus in Fig. 8 the grinding roll 1 is shown as having an upper zone 218 of relatively coarse grit, while the lower zone 219 is of fine grit. Of course other forms of machining rolls or discs may be used.

What is claimed is:

1. In a grinding apparatus, a rotary cutting wheel having a fixed axis, said wheel forming a grinding surface, an angularly movable support for an object to be ground by the wheel, means providing an axis of rotation for said support, and spaced from the grinding surface whereby angular motion of the support causes a cylindrical surface to be ground, about said axis of rotation, a spindle upon which said support is mounted, a common frame for supporting said spindle and the wheel, said frame having a socket for slidably receiving the spindle, said spindle being splined in the socket, and means for adjusting the spindle in relation to the frame, for adjusting the position of the axis of rotation.

2. In a grinding apparatus, a rotary cutting wheel having a fixed axis, said wheel forming a grinding surface, an angularly movable support for an object to be ground by the wheel, means providing an axis of rotation for said support, and spaced from the grinding surface whereby angular motion of the support causes a cylindrical surface to be ground, about said axis of rotation, means for adjusting the position of said axis of rotation, and means forming a gauging surface parallel to said axis of rotation and mounted on the means providing the axis of rotation for said support, said gauging surface having a normal thereto intersecting the said axis of rotation and being spaced angularly about said axis of rotation from the line joining the two axes, comprising an arm, means for angularly and axially adjusting said arm about an axis normal to and intersecting said axis of rotation, and means forming a pair of gauging surfaces respectively in fixed position with respect to the arm and to the support for cooperating with a pin gauge to directly and accurately position the gauging surface in said arm with respect to the axis of rotation.

3. In a grinding apparatus, a rotary cutting wheel having a fixed axis, said wheel forming a grinding surface, an angularly movable support for an object to be ground by the wheel, means providing an axis of rotation for said support, and spaced from the grinding surface whereby angular motion of the support causes a cylindrical surface to be ground, about said axis of rotation, an axially slidable bar upon which said support is mounted and having an axis transverse to the axis of rotation, a screw mechanism for adjusting the position of the bar, and an axially adjustable spindle for supporting said bar, as well as the means providing the axis of rotation, for movement toward or away from the grinder axis.

4. In a grinding apparatus, a rotary cutting wheel having a fixed axis, said wheel forming a grinding surface, an angularly movable support for an object to be ground by the wheel, means providing an axis of rotation for said support, and spaced from the grinding surface whereby angular motion of the support causes a cylindrical surface to be ground, about said axis of rota-

tion, and means for adjusting the position of said axis of rotation, said support comprising a split hub, and a tube axially movable through said hub, whereby said support may be adjusted along said axis of rotation.

5. In a grinding apparatus, a rotary cutting wheel having a fixed axis, said wheel forming a grinding surface, an angularly movable support for an object to be ground by the wheel, means providing an axis of rotation for said support and spaced from the grinding surface, whereby angular motion of the support causes a cylindrical surface to be ground about said axis of rotation, means for adjusting the position of said axis of rotation with respect to the wheel axis, an arm providing a gauging surface for said cylindrical surface, a bar upon which said arm is slidably mounted, said bar extending normally to said axis of rotation, and means whereby said arm is rotatable about the axis of said bar optionally to so position said gauging surface that it is parallel to said axis of rotation and has a normal intersecting the axis of rotation.

6. In a grinding apparatus, a rotary cutting wheel forming a vertically extending grinding surface, a frame for supporting said wheel, an angularly movable support for the work to be ground by the wheel, a support member providing an axis of rotation for said work support, and spaced from the grinding surface, whereby angular motion of the support causes a cylindrical surface to be ground about said axis, a bar for supporting said member and extending in a generally horizontal direction and being offset from the axis of the grinding wheel, said bar being slidably supported by a socket in the frame, means to prevent rotation of said bar in the socket, and means to move said bar axially to adjust the distance between said axis of rotation and the grinding surface.

7. In a grinding apparatus, a rotary cutting roll having a vertically extending axis, a frame for supporting the roll, an angularly movable support for the work to be ground, a support member providing an axis of rotation for the work support, said axes being parallel and spaced so that the axis of rotation is spaced from the surface of said roll, whereby angular motion of the support causes a cylindrical surface to be ground about said axis of revolution, a bar for supporting said member and extending horizontally, the bar being offset from the roll axis, said bar being slidably supported by a socket in the frame, means to prevent the bar rotating in the socket, means to move the bar axially to adjust the distance between said axes, and means to move the work support radially with respect to said axis of rotation to adjust the position of the work with respect to the grinding roll.

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