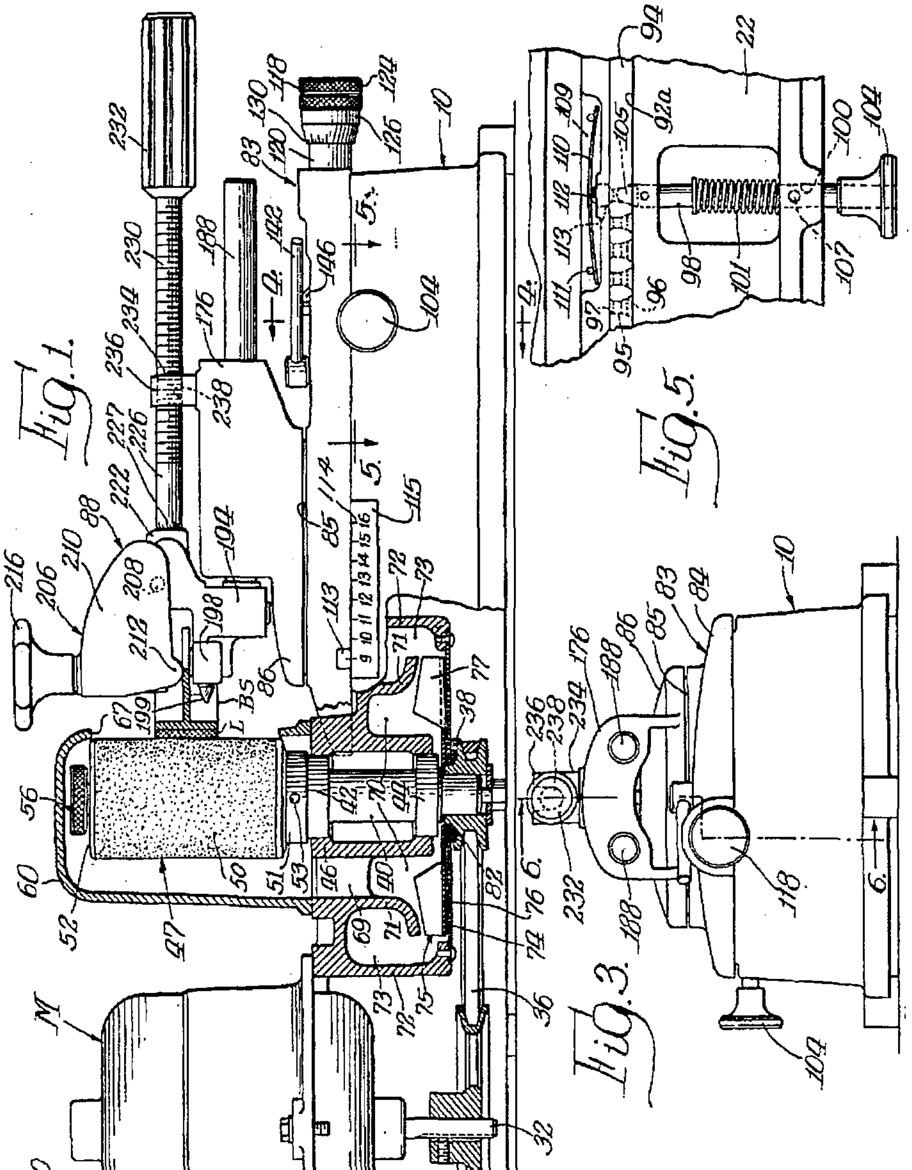
Feb. 14, 1956 H. R. BILLETER 2,734,319

GRINDING DEVICE

Filed Jan. 21, 1953 4 Sheets-Sheet 1



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GRINDING DEVICE

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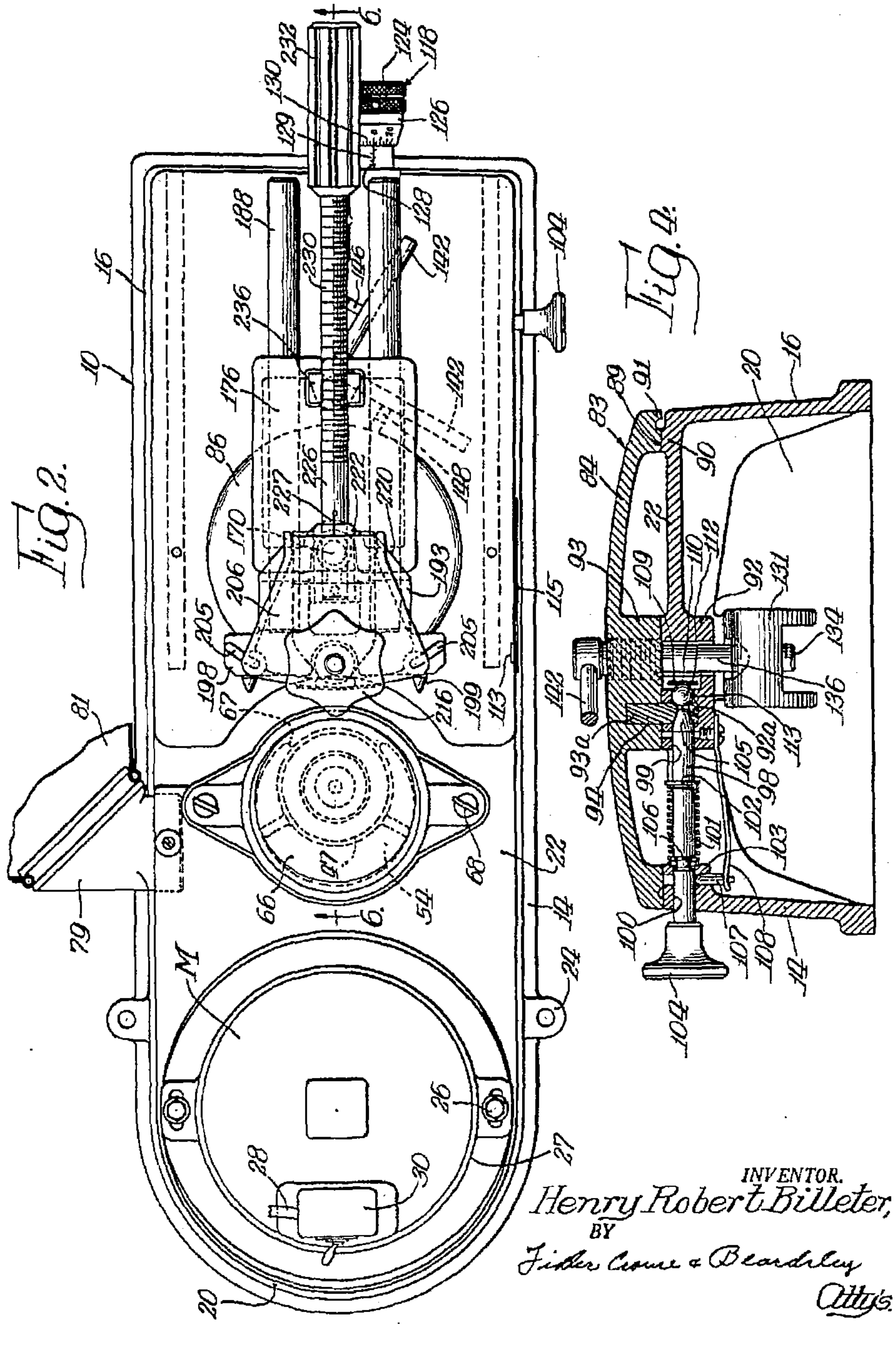

Fig. 2.

Fig. 4.

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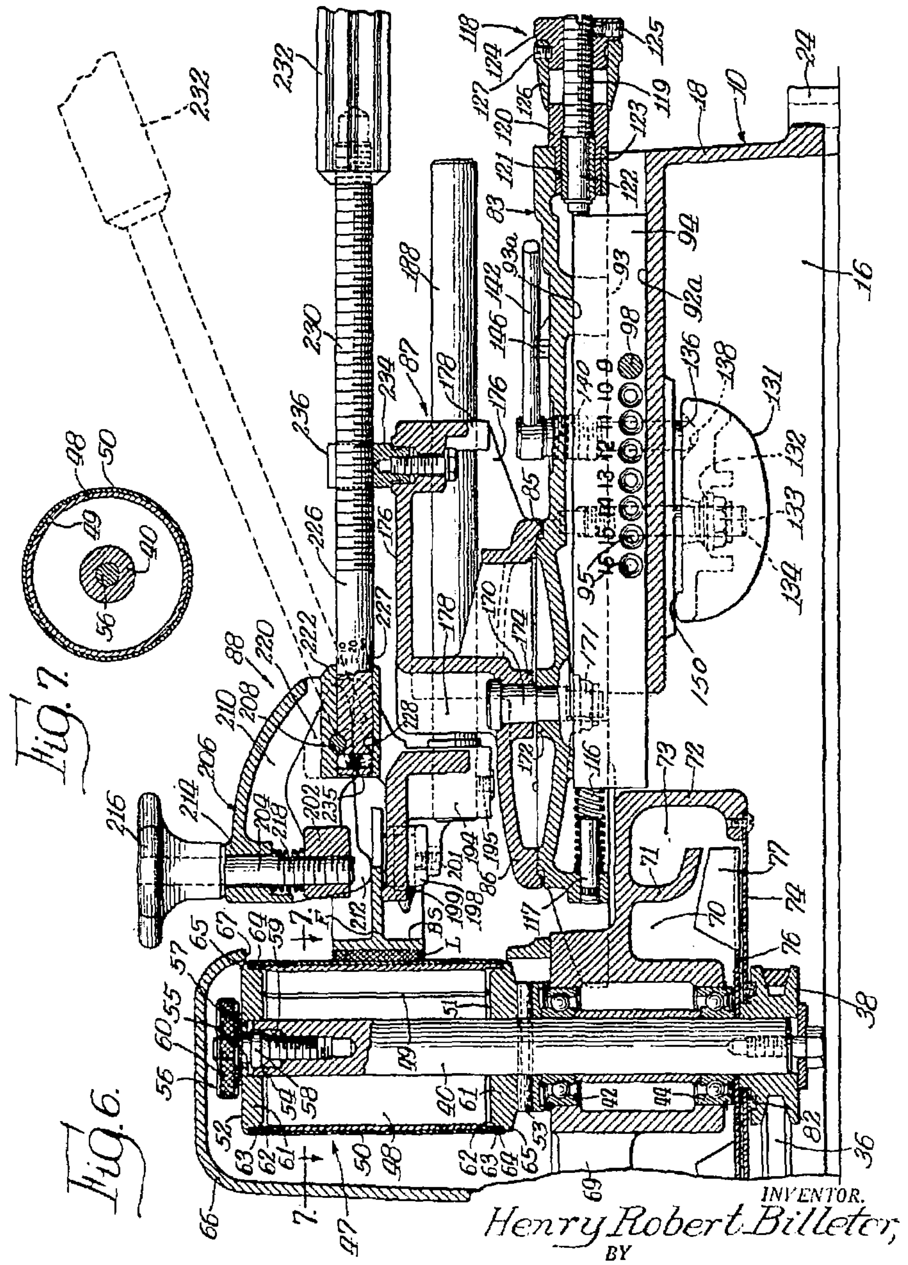
GRINDING DEVICE

Filed Jan. 21, 1953 4 Sheets-Sheet 3



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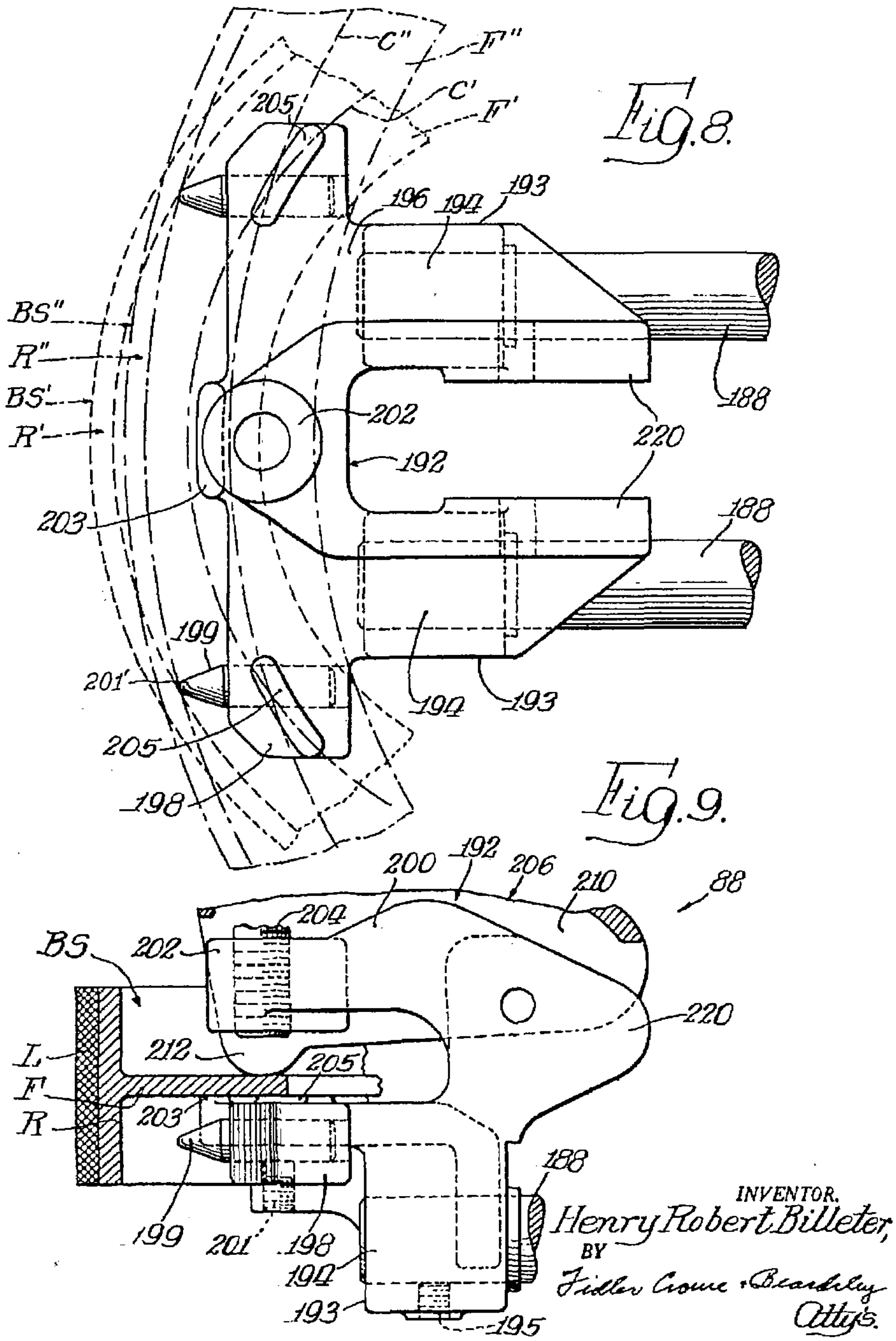

Fig. 8.

Fig. 9.

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2,734,319

GRINDING DEVICE

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Application January 21, 1953, Serial No. 332,310

7 Claims. (Cl. 51—96)

The present invention relates to a grinding device and has to do particularly with improvements in a grinding device of the character disclosed and claimed in my prior application, Serial No. 180,425, filed August 19, 1950.

The grinding device to which the present invention relates is particularly adapted for grinding arcuate contours and especially well adapted for dressing down the exposed arcuate surfaces of automotive brake shoe linings to produce a true cylindrical face of proper radius to fit the brake drum with which the brake shoe is to be used.

In processing lined automotive brake shoes it is usually necessary to dress down a new lining so that the radius of curvature is the same as that of the brake drum with which the brake shoe is to be used in order that the entire braking surface of the shoe will engage the brake drum when the brakes are applied. When a brake drum becomes worn, it is usually bored out to insure that its braking surface is truly cylindrical and as a result its radius is greater than the radius of the brake shoe with which it is associated. When an oversize brake lining is applied to such brake shoe it is usually necessary to dress down the surface of the brake lining until its exposed curved surface is truly cylindrical, if it was not theretofore cylindrical, and of a proper radius to accurately fit the inside surface of the brake drum.

The present invention includes improvements in a device for grinding brake shoes according to the above considerations, having a rotatable grinding element, a carriage mounting a brake shoe holder for oscillation relative to the grinding element, means for adjustably moving the carriage toward and from the grinding element for correspondingly adjustably positioning the axis of oscillation of the brake shoe holder in spaced relation to the grinding element, and means for adjustably moving the brake shoe holder relative to the carriage in directions toward and from the grinding element whereby the brake shoe holder may be adjustably so moved relative to an axis of oscillation fixed relative to the grinding element.

An object of the invention is to provide in a device of the foregoing general character novel means for releasably securing the carriage in adjusted positions.

Another object is to provide a device of character noted having novel locking means for releasably securing the carriage in any of a number of predetermined spaced positions and novel means for releasably retaining the locking means in disabled position.

Still another object is to provide a device of the character referred to, having novel locking means for releasably securing the carriage in any of a number of predetermined spaced positions, means for releasably retaining the locking means in disabled position, and means serving to indicate to the operator the positioning of the carriage in any of the predetermined positions, facilitating movement of the locking means to locking position.

A further object is to provide a device of the above general character having means for effecting fine adjustments of the carriage relative to any of its predetermined spaced positions, in which the adjusting means is of novel construction facilitating its setting to zero position.

Still another object is to provide a device of the foregoing character having novel means for stably mounting the brake shoe holder on the carriage in such a way as to effectively withstand tendency to displacement of the holder relative to the grinding element so as to preserve proper alignment of the brake shoe held in the holder relative to the grinding element.

Another object is to provide in a brake shoe grinder, a grinding element of novel construction including a cylindrical abrasive sleeve, and means for retaining the sleeve in accurate, predetermined dimensions.

A further object is to provide a brake shoe grinder having a grinding element including a flexible, cylindrical abrasive sleeve, and means for supporting the flexible sleeve in the form of an inner sleeve yieldably expansible in directions for increasing its diameter but capable of being rigidly held against deflection from substantially cylindrical shape.

Another object is to provide a brake shoe grinder having a rotatable grinding element and a housing at least partially surrounding the grinding element, and means for collecting dust from the housing generated by a grinding operation, in which novel means is provided for sealing the portion of the housing in which the grinding element rotates against the emission of dust therefrom.

Other objects and advantages of the invention will be apparent from the following detail description taken in conjunction with the accompanying drawings in which—

Fig. 1 is a side elevational view of a brake shoe grinding apparatus constructed in accordance with the principles of the present invention, certain of the parts being shown as broken away and others sectioned to more clearly reveal the nature of the invention;

Fig. 2 is a top plan view of the apparatus;

Fig. 3 is a front elevational view thereof;

Fig. 4 is an enlarged, fragmentary cross-sectional view taken approximately on the line 4—4 of Fig. 1;

Fig. 5 is an enlarged fragmentary view taken substantially on line 5—5 of Fig. 1;

Fig. 6 is an enlarged fragmentary sectional view taken substantially on line 6—6 of Fig. 2;

Fig. 7 is a cross-sectional view taken on line 7—7 of Fig. 6;

Fig. 8 is a top plan view of the lower brake shoe clamp, with broken lines showing somewhat diagrammatically the relative positions taken by two brake shoes of different sizes when in position in the clamp; and

Fig. 9 is a side elevational view of the lower brake shoe clamp and showing also a portion of the upper clamp and somewhat diagrammatically a brake shoe in position in the clamps.

The grinding device of the present invention is especially well adapted for grinding to true cylindrical contour the surfaces of linings attached to automotive brake shoes and the device is described herein in connection with such use for the purpose of illustration. It will be understood that the invention is not thus limited and that the principles may be applied to other uses where generally similar results are desired.

Referring now to the drawings in detail and in particular to Fig. 1, the grinding device includes a base or frame 10 in the form of an elongated rectilinear casing-like member having a base flange 12 extending therearound from which there extends upwardly and inwardly, preferably at a slight taper, a pair of side walls 14 and 16, a front wall 18 and a curved rear wall 20. The top wall 22 of the structure constitutes a bed plate upon which is mounted the principal operating elements of the apparatus. The flange 12 is formed with a plurality of supporting feet or pads 24 by means of which the base 10 may be secured to a supporting surface such as a work bench, with the flange 12 slightly elevated from the surface thereof to permit circulation of air beneath the apparatus for purposes that will become apparent presently.

Supported within an opening 25 (Fig. 1) formed in the top wall of the base 10 is an electric motor M which is suitably secured to the base as by means of a mounting bracket 27 and bolts 26. Current may be supplied to the motor by means of a cable 28 and a conventional switch assembly 30 is provided to control the motor circuit. The motor M serves to drive a grinder 47 of novel construction adapted to dress down the surface of a brake shoe lining and hence is provided with a shaft 32 which projects downwardly in the base 10 and carries a driving pulley 34 thereon operatively connected by a driving belt 36 to a driven pulley 38 mounted on a vertically extending shaft or spindle 40 which projects through an opening in the bed plate 22 of the base 10. The shaft 40 is mounted in upper and lower antifriction bearings 42 and 44, respectively, carried in a boss 46 formed in the bed plate. The shaft 40 projects upwardly above the bed plate and detachably carries at its upper portion the grinding element 47 referred to above and shown in detail in Figs. 6 and 7. The grinding element includes an inner sleeve 48 of substantially cylindrical form having an axially extending slot 49 throughout its length. The sleeve 48 is preferably of aluminum and, as such, is relatively rigid with respect to resistance to deflection in localized areas, but due to the provision of slot 49, the sleeve has a limited degree of yieldability in that it can be slightly expanded so as to increase its diameter beyond its normal diameter. The sleeve contracts and assumes a normal relatively small diameter when it is dismounted from the shaft in which the slot 49 may be substantially closed or at least reduced in dimension in circumferential direction. When the aluminum sleeve is placed on the shaft it is slightly expanded in diameter whereby the slot 49 is slightly widened and the sleeve in the expansion thereof comes into engagement with the outer abrasive sleeve 50 for frictionally supporting the abrasive sleeve and maintaining it in true cylindrical form. The outer abrasive sleeve 50 is preferably made up of a relatively flexible material such as a web with abrasive material on its outer surface. The abrasive sleeve may be formed as by wrapping a strip of material on a suitable form and securing the adjacent convolutions together as by adhesive material, and preferably the abrasive sleeve consists of several layers in superposed relation. The completed abrasive sleeve thus has a normal cylindrical shape of nominal dimensions although it is relatively flexible and may be deformed.

The inner sleeve 48 has a normal diameter slightly less than the nominal diameter of the abrasive sleeve and the means for mounting the aluminum sleeve produces an expansion of the aluminum sleeve so that it frictionally and tightly engages the abrasive sleeve and maintains it in truly cylindrical shape and of the desired ultimate dimension.

The means for mounting the sleeve assembly made up of the inner sleeve 48 and outer sleeve 50 includes a lower washer 51 and an upper washer 52, the lower washer being secured to the shaft 40 for rotation therewith by suitable means such as a pin 53 extending diametrically through a hole in the hub of the washer and shaft. The lower washer 51 is adapted to rest on the upper bearing 42 and thereby serves as a means for supporting the shaft in axial position. The upper washer 52 has a recess 54 adapted to snugly receive the upper end of the shaft and a smaller diameter aperture 55 for receiving the shank of a screw 56, the aperture being surrounded by an inturned flange 57. The screw shank is threaded for threading into a tapped hole in the shaft, and is provided with a projection 58 fitted in an enlarged portion 59 of the recess in the shaft, and a knurled head portion 60.

The washers 51 and 52 include central portions 61 having chamfered edge surfaces 62, and outwardly from the chamfered surfaces are cylindrical surfaces 63 terminating in shoulders 64 defined by radial flanges 65 of relatively small radial dimension.

The sleeves 48 and 50 are mounted by placing them in assembled, telescope condition over the upper end of the shaft into engagement with the lower washer 51, the inner sleeve 48 engaging a chamfered surface 62 on the lower washer. The upper washer 52 is then fitted over the sleeves and the screw 56 is threaded into the tapped hole in the shaft which forces the upper washer downwardly and the two washers relatively toward each other. The chamfered surfaces 62 on the two washers expand the sleeves to the dimension determined by the cylindrical portions 63, whereupon expansion of the sleeves ceases and continued threading of the screw 56 brings the shoulders 64 into engagement with the ends of the sleeves. The sleeves are then rigidly mounted in assembly, the tendency of the aluminum sleeve 48 to contract acting to establish the desired frictional engagement between that sleeve and the washers for the rotation of the sleeve on the shaft. The engagement of the shoulders 64 with the aluminum sleeve limits the movement of the washers toward each other and establishes a firm and solid assembly. The recess 54 receives the upper end of the shaft and hence the upper washer 52 is positioned concentric with the shaft for true rotation of the sleeve with the shaft. The collar or projection 58 serves to engage the flange 57 in removing the screw 56 from the shaft whereby a positive force is provided for removing the upper washer 52 from the shaft and thereby from the sleeve assembly. The grinding element 47 when assembled on the shaft as above described forms a rigid cylindrical grinding wheel which serves to accurately grind the brake shoe in conjunction with the accurate positioning of the brake shoe relative to the grinding element.

A hood 66 having an open front 67 is removably secured to the base 10 as by means of wing fastening studs 68 (Fig. 2) and substantially encloses the grinding element 47. The interior of the hood 66 communicates through a series of openings 69 with the interior of an annular suction chamber 70 surrounding the boss 46 beneath the bed plate 22 and defined between the boss 46 and a depending circular flange 71 integral with the bed plate. A second circular flange 72 formed on the bed plate depends therefrom and surrounds the circular flange 71 to define therewith an annular dust-collecting chamber 73. A ring-like cover plate 74 is removably secured to the flange 72 and encompasses the driven pulley 38 and serves as a closure for the dust-collecting chamber 73. Preferably the cover plate 74 closely approaches the hub of the pulley and above the cover plate is an impeller 75 disposed in the chamber 70 and preferably consists of a sheet metal stamping including a disc-like portion 76 and blade elements 77. The impeller may be secured in place for rotation with the pulley and shaft by securement between the pulley and bearing 44. The impeller 75 serves to draw air and the comminuted products of abrasion from the hood 66 into the suction chamber 70, and to expel the same by the action of centrifugal force into the dust-collecting chamber 73. The chamber 73 communicates with an elbow device 79 (Fig. 2) which projects through the side of the wall of the base and to which there is removably attached by means of a garter spring a dust-impervious but porous dust-collecting bag 81.

In order to seal the suction chamber 70 and the dust-collecting chamber 73 against the efflux of dust and comminuted materials around the shaft 40, the pulley 38 is provided with a seal 82 in the form of a ring of resilient material fitted in an annular groove in the pulley and engaging the under surface of the cover plate 74. The resilient sealing ring 82 is of greater diameter than the central opening in the cover plate 74 and, being in yielding engagement with the cover plate, seals the chamber 70 against the passage of dust around the shaft.

Referring now to Figures 4 and 6, a carriage 83 is slidably disposed on the upper surface of the bed plate 22 for adjustable movement toward and away from the grinder 47. The carriage 83 is formed with an arcuate upper surface 84 (Fig. 4) of relatively long radius of curvature, which surface is formed with a flat circular turntable bed or supporting surface 85 (Figs. 1 and 6) on which there is rotatably disposed a circular turntable 86 forming part of a pivoted carriage 87 adapted to support a brake shoe holder 88. The carriage 87 pivots about a pivot axis established by a pivot pin 170 as explained more in detail hereinafter.

The carriage 83 is provided with downwardly extending slide rails 89 (Fig. 4) which rest upon slide rails 90 which project upwardly from and extend longitudinally of the bed plate 22. A continuous marginal flange 91 overlies the edge of the top wall 22 and serves to protect the rails 89 and 90 against the accumulation of the products of abrasion.

The bed plate 22 is formed with an integral longitudinally extending depending rib 92 having a longitudinal groove 92a formed in its upper surface, and the carriage 83 is formed with a longitudinally extending, depending rib 93 having a longitudinal groove 93a in its lower surface and in register with the groove 92a. An indexing bar 94 which is rectangular in cross section is slidably disposed in and enclosed within the grooves 92a and 93a and serves in the manner of a key or guide rail to align the carriage 83 on the bed plate 22 in proper cooperating relationship with respect thereto, while at the same time permitting longitudinal adjusting movement of the carriage 83 on the bed plate 22 in a direction toward and away from the grinder. The indexing bar 94 constitutes the sole means for guiding the carriage 83 against the lateral displacement on the bed plate 22. It also serves as an element of the indexing means hereinafter described for selectively positioning the carriage 83 in any one of a plurality of spaced, predetermined positions on the base 10.

The indexing bar 94 has formed therein a series of longitudinally spaced aligned openings or index holes 95, each of which is bell-mouthed at one end as at 96 (Fig. 5), and provided with a relatively short bevel or taper 97 at the other end. The holes 95 are adapted upon movement of the indexing bar 94 to be selectively brought into register with the inner end of an indexing or locking pin 98 which is slidably disposed in a bore 99 formed in the rib 92 and opening into the groove 92a and in a bore 100 formed in a side wall 14 of the base 10. A coil spring 101 surrounding the pin 98 bears at one end against a washer 102 carried by the pin and at the other end against an internal boss 103 to yieldingly urge the pin inwardly of the base so that the inner end thereof may enter and is yieldingly held in a selected opening 25 of the guide bar. A handle or knob 104 is provided on the outer end of the locking pin 98 to facilitate manipulation of the latter, and the inner end of the pin is tapered at 105. The taper 105 of the pin and the bell-mouth shape 96 of the holes are so relatively shaped and proportioned that substantially line contact therebetween is established, at a position disposed well inwardly of the ends of the holes, so that accurate alignment of the indexing bar will be effected as will be referred to later. Adjacent its outer end, the locking pin 98 is provided with an annular groove 106 adapted to receive a detent plunger 107 slidably disposed in the boss 103, radially of the locking pin, for yieldingly retaining the locking pin in retracted position (to the left, Fig. 4). The detent plunger 107 is biased upwardly or toward the locking pin by means of a leaf spring 108 solidly anchored at its inner end by suitable means and with its outer end normally biased upwardly and engaging the detent plunger. When the locking is retracted and the groove 106 is in register with the detent 107, the latter is biased upwardly into the groove and releasably retains the locking pin in retracted position. The groove and detent have interengaging surfaces acting as camming surfaces effective to retract the detent in response to pressure applied to the pin for that purpose. When the locking pin is in such retracted position its inner end is clear of the holes 95 enabling sliding movement of the guide bar or indexing bar 94 for selectively positioning the holes 95 for reception of the pin.

The rib 92 is also provided with a recess 109 (Figs. 4 and 5) opening upwardly through the upper surface bed plate. Removably disposed in the recess 109 is a leaf spring 110 engaging at its ends with pins 111 fixed in the floor of the recess and engaging at its central portion with a ball 112 located in an aperture 113 which opens through from the recess 109 to the groove 93, and which is in alignment with the locking pin 98. The aperture is of appropriate size to enable free movement of the ball and the ball is of such a diameter that it enters into the tapered portions 97 of the holes 95 only to a slight extent (Figs. 4 and 5). The leaf spring biases the ball toward the indexing bar 94 and when any one of the holes 95 is in register with the ball the latter is biased so as to enter the hole to a slight amount, whereby in the movement of the carriage as hereinafter explained, the operator experinces a "Feel" that one of the holes 95 is engaged by the ball and hence is in register with the locking pin 98 for receiving the latter. Preferably the leaf spring 110 can be removed merely by gripping and lifting it out and it is restrained against longitudinal movement by the end walls of the recess, and normally against upward removal by the adjacent element of the carriage 83.

The retention of the locking pin in retracted position eliminates chattering of the locking pin in engaging the holes, as when the operator would retract the pin and release it when the carriage and indexing bar is moved, and consequent wearing of the edge surfaces of the holes. The ball 112 is normally effective to retain the indexing bar in the selected position by engagement with the corresponding hole, but if for any reason the selected hole is not accurately aligned with the locking pin, the tapered surface on the pin will engage the bell-mouth surface on the hole and produce a camming effect on the indexing bar and move it to accurate position. The ball enters the hole to such a slight extent that only relatively flat camming surfaces are established therebetween. Any wearing or mutilation that may occur on the edge surfaces of the holes will not affect the desired line contact engagement between the pin and hole, and accurate alignment of the indexing bar is thus obtained.

In order that the operator may determine which index hole 95 is in register with the end of the locking pin 98, a reference mark 113 (Fig. 1) is provided on the carriage 83 and cooperates with the index scale 114 which for convenience may be provided on the machine name plate 115 which may be attached to the side wall 14. The carriage 83 is operatively connected to the indexing bar 94 so that it is maintained in adjusted position on the base 10 as determined by the position of the indexing bar 94. To this end the indexing bar 94 (Fig. 6) is normally urged toward the forward end of the carriage 83 by a compression spring 116 centered on a pin 117 projecting inwardly from the rear end of the carriage 83 and bearing against the rear end of the indexing bar 94. A micrometer adjusting screw 118 of novel construction is provided at the front end of the carriage in position to be abutted by forward end of the indexing bar and serves to determine the forward position of the indexing bar relatively to the carriage.

The indexing holes 95 are so located on the indexing bar 94 as to establish spaced predetermined positions of the carriage 83 on the base 10 and accordingly to establish corresponding predetermined positions of the pivot axis of the carriage 87 relative to the surface of the grinding element 47. In the present illustrative embodiment the indexing holes 95 are spaced apart on one-half inch centers and are so located as to determine positions of the aforesaid pivot axis spaced from the grinding element 47, ranging from 4½ inches to 8 inches. The several indexing holes 95 are labeled respectively with indicia representing diameters corresponding to the respective radii which the holes establish as above explained. For example, the hole 95 at the right hand end of the series (as viewed in Fig. 6) is so located that when the carriage is in the position in which that hole is in registry with the locking pin 98 and the screw 118 is in its zero position, the pivot axis of the carriage is exactly 4½ inches from the surface of the grinding element.

The adjusting screw 118 is made up of relatively adjustable elements enabling its setting to an accurate zero indicating position, thereby eliminating the necessity for extreme accuracy in this respect in the manufacture thereof. The adjusting screw 118 includes a shank 119 threaded on its outer end portion and preferably provided with a screw driver slot. The inner end is threaded into a bushing 120 suitably secured stationarily in a bore 121 of the carriage in longitudinal alignment with the indexing bar 94. The innermost end portion of the shank is preferably of reduced diameter at 122 and fitted with a sleeve bushing 123 slidable and rotatable relatively to the outer bushing 120. The inner end of the shank engages the indexing bar and serves to provide relative movement between the carriage and indexing bar upon appropriate turning of the adjusting screw. The adjusting screw 118 includes a knob 124 having a radial flange portion and a sleeve portion threaded on the shank and provided with a set screw 125 for engagement with the shank for adjustably setting the knob relative to the shank. The adjusting screw also includes a sleeve 126 telescoped with the sleeve portion of the knob and also provided with a set screw for engagement with the knob for releasably securing the two elements together in adjusted relation. The bushing 120 is provided with indicia markings (Fig. 2) including an axial line 128 and axially spaced lines 129. The sleeve 126 is provided with circumferentially spaced markings 130 cooperating with the markings 128 and 129 on the bushing.

For the purpose of making the initial adjustment of the adjusting screw 118 so that it accurately indicates the adjustment made thereby, the indexing bar 94 is moved to any arbitrary position, for example, to a 9-inch position in which the locking pin 98 enters in the 9-inch hole, i. e., the hole at the far right (Fig. 6). At such position of the indexing bar and at the zero position of the adjusting screw 118 the axis of the pin 170 is to be exactly four and one-half inches from the surface of the abrasive sleeve 51, a measurement in practice obtained by gauging the distance between the axis of the pin 170 and the axis of the grinding element. If, however, the distance between the axes mentioned is not as indicated the operator threads the adjusting screw 118 to the position in which that distance is as desired. Turning of the adjusting screw moves the carriage relative to the indexing bar 94 which is located relative to the base and thereby the carriage is moved relative to the grinding element. Thereafter the operator applies a screwdriver to the slot in the shank 119 and after loosening the set screw 125 rotates the knob 124 until the edge of the sleeve 126 registers with the appropriate indicia marking 129 and then tightens the set screw 125. If the zero marking of the index 130 is not then in register with the line 128 for indicating the zero position, the operator loosens the set screw 127 and rotates the sleeve 126 relative to the knob until such zero position is indicated. The set screw 127 is then tightened. The knob 124 and sleeve 126 thereafter form an effectively integral part. The inner edge of the sleeve 126 thus serves as an indexing line or indicia mark. It is to be understood, of course, that rotation of the sleeve 126 relative to the knob does not produce any axial movement of the sleeve relative to the knob, and upon setting of the shank 119, setting of the knob 124 fixes the axial position of the adjusting screw and securement of the sleeve on the knob fixes the sleeve and thereby the assembled adjusting screw in circumferential or rotational direction with respect to the zero position. The construction of the adjusting screw 118 eliminates the necessity for justifying the threads on the screw and provides a simple and effective means for making the proper initial accurate setting.

Means are provided for securely locking the carriage 83 to the bed plate 22 in any one of its indexed or adjusted positions. To this end a locking assembly is provided which includes clamp shoe 131 (Figs. 4 and 6) tiltably supported on a collar 132 which is supported on an adjusting nut 133 threadedly received on the lower end of a stud 134, the other end of which is threadedly received in the carriage 83. A thrust pin 136 has its lower end seated in a depression 138 provided in the clamp shoe 131 and has a portion 140 thereof threadedly received in the carriage 83. A handle 142 is fixedly received in the head 144 of the thrust pin 136 and is adapted to be swung from the full line position thereof indicated in Fig. 2, wherein it is in engagement with a limit stop or abutment 146, to a dotted line position wherein it is in engagement with an abutment 148. In the full line position of the handle 142, the clamp shoe 131 has its clamping surface 150 in light engagement with the underneath surface of the bed plate 22 while in the dotted line position of the handle 142 the clamping surface 150 bears firmly against the underneath surface of the top wall 22 of the base 10 and serves to lock the carriage 83 in its desired position of adjustment. The rib 92 is provided with a longitudinally extending slot through which the stud 134 and pin 136 extend, enabling sliding movement of the carriage.

A headed pivot pin 170 (Fig. 6) in the form of a shoulder bolt extends through and is secured to the carriage 83 centrally of the bed surface 85 thereof as by a nut 171 and passes through bosses 172 and 174, provided on the carriage 83 and on the turntable 86 respectively, and serves to center the turntable 86 on the bed 85 while permitting turning movement of the carriage 87 as a whole about the axis of the bolt 170, which is the pivot axis above mentioned. In the manufacture of the device, the head of the bolt 170 is held to close tolerances and accurate concentricity relative to the shank, so as to provide an accurate reference point for the initial setting of the device.

The carriage 87 includes an upstanding portion 176 having a pair of transversely spaced bearings 178 formed therein each of which may consist of longitudinally spaced portions formed in opposite wall members of the portion 176. The bearings 178 respectively receive therein elongated rods or supporting bars 188 for longitudinal sliding movement of the rods or supporting bars in the bearings and consequent movement of the brake shoe holder 88 to be later described, toward and from the grinding element relative to any given fixed position of the carriage 83.

The brake shoe holder or chuck 88 (see Figs. 6, 8 and 9) includes a lower clamp or supporting bracket 192 having transversely spaced portions 193 (Figs. 2 and 8) each of which has a tubular element 194 receiving the rear end of one of the supporting bars 188 and secured thereto by means of a set screw 195, so as to be movable unitarily with the supporting bars.

The supporting bracket 192, which may be formed as a casting, includes a lower, generally T-shaped portion 196 (Fig. 8) which has formed thereon at spaced points a pair of bosses 198, each having an upstanding rib or pad 205 designed for reception thereon of the arcuate center flange F of a brake shoe BS, the lining L of which is to be ground. A locating pin 199 extends through each boss 198 and is adapted to be adjustably secured in position therein as by means of a set screw 201. The locating pins 199 preferably have tapered ends 201 adapted to engage the inner surface of the brake shoe rim R at spaced points therealong when the brake shoe is placed in the holder to properly position the brake shoe therein.

The supporting bracket 192 is provided with an overlying portion 200 including a threaded boss 202 which receives therein the threaded end of a clamping stud 204. An upper clamp or clamping head 206 slidable on clamping stud 204 is provided with an apron 210 which encloses the boss 202 and certain other elements hereinafter described, and a pair of spaced toes 212 formed at spaced points at its rear end and disposed above and in alignment with the pads 205 for clamping engagement with the upper surface of the flange F of the brake shoe to be processed. The clamping stud 204 passes through a boss 214 formed on the head 206 and is provided with a manipulating knob 216 by means of which the head 206 may be moved downwardly to bring the toes 212 into clamping engagement with the flange F of the brake shoe. A spring 218 disposed between the apron 210 and overlying portion 200 of the supporting bracket 192 serves to yieldingly urge the movable head 206 toward open position relatively to the supporting bracket 192.

The portion 196 is also provided with a third upstanding rib or pad 203 located intermediate the two outer pads 205, the upper surface of the pad 203 and the upper surfaces of the pads 205 lying in a common plane perpendicular to the abrasive surface. The pad 203 and the two pads 205 are disposed generally along the arc of a circle and are so located that when any brake shoe within the range of sizes which the holder is designed to accommodate is disposed in position in the holder, the flange of such brake shoe is engaged by the three pads 203 and 205 at points approximately equidistant from the rim, which points lie in the aforementioned plane which is perpendicular to the abrasive surface. Accordingly, and as will appear hereinafter, any brake shoe within the aforesaid range of sizes will be supported in position with its braking surface extending substantially vertically and therefore substantially parallel to the abrasive surface of the grinder.

In the case of many conventional brake shoes the flange extends with its medial plane perpendicular to the exposed braking surface of the brake shoe lining, but since the flange increases in thickness in a direction from the rim toward the inner edge of the flange, the faces of the flange therefore are not planar and are not parallel to the medial plane of the flange but are portions of cones and diverge from the rim and are inclined to the medial plane. Accordingly, if the brake shoe were supported in the grinder of this invention with one face of the flange clamped against a flat, horizontal surface, or two spaced surfaces, extending over a substantial portion of the radial length of the flange, or three surfaces not equidistant from the rim, the brake shoe would be positioned with its medial plane inclined to the abrasive surface and consequently the exposed braking surface would also be inclined to the abrasive surface. However, in the holder of the present invention the flange of the brake shoe is clamped against three spaced supporting surfaces of relatively narrow extent (measured in a direction radially of the brake shoe) and the surfaces are so arranged that they engage the brake shoe at three spaced points approximately equidistant from the rim. Since, as aforesaid, the three supporting surfaces lie in a plane normal to the abrasive surface the brake shoe is therefore supported with its exposed braking surface, extending substantially parallel to the abrasive surface, i. e., in a position that may be, for practical purposes, considered parallel, because the variation from parallel arrangement in any particular case would be negligible. In order to permit the holder to accommodate brake shoes of various radii, as for example brake shoes for brake drums having diameters ranging from 9 to 16 inches, the pads are disposed so that they engage any brake shoe within the aforesaid range of sizes at points which are approximately equidistant from the rim.

Referring now to Fig. 8 wherein there is shown somewhat diagrammatically the relative positions of two brake shoes in position in the holder, namely, the smallest standard brake shoe BS' and the largest standard brake shoe BS'', respectively. It will be noted that the two outer pads 205 are positioned to engage the flanges F' and F'' of the respective brake shoes BS' and BS'' at points along lines C' and C'' representing arcs drawn about the centers of curvature of the rims R' and R'' of the brake shoes BS' and BS'', respectively, and passing along the flanges F' and F'' intermediate the rims R' and R'' and the inner edges of the flanges F' and F''. The center pad 203 is positioned to engage the flanges at a point on each flange respectively between the arcs C' and C''. Accordingly, while the center pad 203 does not engage either flange at precisely on the arc drawn about the center of curvature it does engage each flange at a point sufficiently close to such arc that the error thus resulting does not seriously affect the proper positioning of the brake shoe in the holder.

While the holder has been described with particular reference to its use in connection with brake shoes having tapered flanges, it will be apparent that it is also suitable for use with brake shoes having flanges of uniform thickness.

Means are provided for adjustably positioning the supporting bars 188 and the holder 88 relatively to the pivoted carriage 87 and for rocking the latter about its pivot. Such means includes a tubular socket member or block 222 of externally square cross-section, tiltably mounted upon a rock shaft 208 and provided with a cylindrical bore 224 therein adapted to receive one end of an elongated operating rod 226. The rock shaft 208 extends between and is supported in a pair of forwardly extending side flanges 220 (Figs. 6, 8 and 9) formed on the supporting bracket 192. The rear end of the rod 226 is provided with an annular groove 228 therearound and the rock shaft 208 passes through the socket member 222 in such a manner that it enters the groove 228 and serves as a locking pin for holding the end of the operating rod 226 within the bore 224 of the socket member 222 against longitudinal or axial shifting movement while at the same time permitting free turning movement of the rod 226 relative to the socket member 222.

From the above description of parts it will be seen that the rock shaft 208 serves the functions of tiltably supporting the socket member 222 and of holding the end of the operating rod 226 within the bore 224 of the socket member 222.

The operating rod 226 extends forwardly of the brake shoe supporting assembly to overlie the forward end of the machine and is provided with threads 230 throughout the major portion of its length. A handle 232 (Fig. 1) is secured on the forward end of the rod 226 in order that an operator may impart turning movements to the rod as well as to oscillate the same from side to side. The threaded portion 230 of the rod 226 is adapted to be received in a "half-nut" structure 234 provided on the carriage 87 by virtue of a pair of upstanding members or ears 236 (Figs. 2 and 3) which define therebetween a semicircular threaded bore 238, the threads of which are designed for cooperation with the threads 230 on the rod 226. The flat sides of the socket 222 cooperate with the side flanges 220 to constitute means for maintaining the threaded portion 230 of the rod 226 in vertical alignment with the half-nut 234 so that upon downward swinging movement of the rod 226 in any position of the turntable the threaded portion 230 will fall into register automatically with the half-nut 234.

Since the rod 226, by virtue of its reception in the socket member 222 is pivoted for rocking movement about the axis of the rock shaft 208 in a vertical plane, it will be seen that the operator may at will lift the rod

226 out of the half-nut structure 234 to disengage the same therefrom and by applying a thrust or a pull to the rod 226, as the case may be, slide the holder 88 and the supporting bars 188 as a unit longitudinally of the machine toward and away from the grinder 47. Such sliding movement of the holder 88 by the application of a thrust or a pull to the rod 226 provides a fast or coarse adjustment for the purpose of advancing a brake shoe into initial grinding relation with respect to the grinding wheel 47. When the lining L of the brake shoe has been brought into close proximity to the surface of the grinding wheel 47, a fine adjustment may be made by lowering the operating rod 226 into the half-nut 234 for engagement between the threads thereof with the threads 230 on the rod, after which turning movement of the handle 232 in one direction or the other will feed the holder 88, together with the brake shoe supported thereon, toward the cylindrical grinding wheel 47 for grinding purposes. A scale 227, gradulated in thousandths of an inch, is provided on the rod or feed screw 226 and cooperates with a reference mark 229 on the socket member 222 to indicate the extent of the feed just described.

It has been found that the operator when swinging the rod 226 to rock the carriage 87 about its pivot (as hereinafter explained) often tends to turn the rod 226 unintentionally about its axis and thereby advance or retract the brake shoe holder. Accordingly, I preferably provide suitable friction means for inhibiting such turning movement of the rod 226 relatively to the half-nut 234. To this end I preferably form a bore 235 in the end portion of the rod 226 and dispose therein two bearing balls 237 which are yieldingly urged into engagement with the wall of the bore 224 by a coil spring 239 with sufficient force to provide the desired resistance to turning movement of the rod in the socket 222.

The provision of the transversely spaced rods or supporting bars 188 provides great stability of the brake shoe holder 88 so that it will not rock or tilt about a longitudinal axis. This accurate positioning of the brake shoe holder together with the accurate shape and dimensions of the grinding element assure that the brake shoe lining will be ground and finished to a surface of truly cylindrical form. Furthermore, there is no rocking movement of the brake shoe holder about a transverse axis.

To illustrate the operation of the apparatus in processing the lining L of a standard brake shoe BS in new condition, it may be assumed that a 9 inch brake shoe is to be processed for use with a brake drum which is exactly 9 inches in diameter. Thus for effective processing of the lining L, grinding operations on a 4½ inch radius will have to be performed so that the surface of the brake shoe lining will have an arcuate contour formed with a 4½ inch radius. It is necessary, therefore, that during the grinding operation the distance from the pivot axis of the carriage 87 (Fig. 6) to the periphery of the grinding surface of the grinding wheel 47 be 4½ inches. With the handle 142 in its full line position (as shown in Fig. 2), the clamp shoe 131 is free and the carriage 83 is capable of free sliding movement on the bed plate or top wall 22 of the base 10. Inasmuch as the brake shoe is to be ground to a 4½ inch radius no adjustments of the adjusting screw 118 (Fig. 6) are necessary other than to ascertain the fact that the scale 130 is at its zero position.

The end of the indexing locking pin 98 is retracted and the carriage 83 is moved to an approximate position wherein the opening or hole 95 labeled "9" is brought into register with the locking pin 98 (Fig. 5), after which release of the pin 98 will permit the spring 101 to urge the pin inwardly into the opening 95 to index the carriage 83 to its proper position for grinding on a 4½ inch radius. To lock the carriage 83 securely in this position the handle 142 is moved from its full line position to its dotted line position (as shown in Fig. 2), so that the thrust pin 136 engages the depression 138 provided in the clamp shoe 131 to tilt the shoe in a clockwise direction (as viewed in Fig. 6), and thus bind the carriage 83 and base 10 against relative displacement.

Prior to the grinding operation it is, of course, necessary to properly position a brake shoe of the desired size in the holder 88 and accordingly the knob 216 is manipulated to back off the clamping stud 204 to move clamping jaws 212 away from the bosses 198 after which time a brake shoe BS is positioned in the holder with the flange F resting on the surfaces of the pads 203 and 205 and with the locating pins 199 engaging the inner surface of the rim R at spaced points. Tightening of the knob 216 will serve to move the clamping head 206 downwardly and cause the jaws 212 to engage the flange F and clamp the same against surfaces of the pads 203 and 205 in proper position for grinding the lining L of the brake shoe. The brake shoe is positioned in the holder by abutment with the two pins 199 which are so located that the surface of the brake shoe is concentric with the pivot axis of the carriage 87 and the surface of the lining L is closely parallel to the abrasive surface of the grinding wheel 47. Accordingly when the carriage 87 is rocked about its pivot axis, with a brake shoe positioned in the holder 88, the brake shoe surface moves about such axis in a true circular path.

With the brake shoe BS thus positioned in proper alignment with the grinding wheel 47, the holder 88 may, by a fast adjustment as previously described, be brought to a position wherein the lining L is brought into close proximity with the abrading surface of the grinding wheel 47. To accomplish this the operating rod 226 is manually tilted upwardly about its pivotal axis of support on the shaft 208 so that the threaded portion 230 of the operating rod is removed from the half-nut structure after which, by exerting a manual thrust on the rod 226 holder 88 is advanced until the surface of the lining L closely approaches the grinding surface of the grinding wheel 47. At this time the threaded portion 230 of the operating rod is lowered into the half-nut structure 234 to secure the holder 88 in position. With the brake shoe lining L in close proximity to the cylindrical grinding surface of the grinding wheel 47 and with the threaded portion 230 of the rod 226 located within the half-nut structure 234, the operator may, by rotating the rod 226 in a clockwise direction (as viewed in Fig. 3), accurately feed the lining L toward the rotating grinding wheel.

For any setting (i. e. position of adjustment) of the carriage 83 on the base 10, the distance from the center of the pivot pin 170 to the nearest portion of the surface of the grinding element 47 remains constant. Hence, all points on the surface of a brake shoe which are at a distance from the center of the pivot pin equal to the distance between the center of the pin and the surface of the grinding element will, when the holder 88 is rocked about the pivot pin, move in an arc having a radius of curvature equal to the distance between the center of the pivot pin and the surface of the grinding element. When the rod 226 is swung from side to side and rotated to impart feed movement to the holder 88, the surface of the lining will be dressed down by the grinding wheel to a true circular arc having a radius of curvature corresponding to the setting of the indexing means. Screw feed movement of the rod 226 in a direction toward and away from the grinding element regulates the amount of material removed.

In certain instances the operator may wish to dress the lining down a predetermined amount or to determine exactly to what extent the lining has been dressed down. The distance that the holder is moved by the fine screw feed, and thus the extent the lining has been dressed down, may be determined by observing the scale 227 on the rod 226 with reference to the index mark 229 on the socket member 222.

In processing brakes it is often found that the drum had been badly scored and that in order to provide a true cylindrical braking surface the drum has to be bored out to make its surface truly cylindrical. The brake shoe must be relined and dressed accordingly. If, for example, a depth of 0.060 inch of metal is removed from a 10 inch diameter drum thereby increasing the drum diameter by twice that amount, it is apparent that the dressing procedure on an oversize new lining provided on the original brake shoe would have to be conducted with the grinding taking place on a radius of 0.060 inch greater than the fine radius of the original standard drum and brake shoe. In such case it is necessary to adjust the sliding carriage **83** so that the pivot axis of the pivoted carriage **87** assumes a position 5.060 inches from the surface of the grinding wheel **47**, whereby, upon oscillation of the carriage **87** during the grinding operation, the radius of the path of movement of the dressed surface of the lining will be 5.060 inches.

To provide for the grinding of a brake shoe lining L on such an oversize radius of curvature as that given in the example outlined above, it is merely necessary for the operator to index the carriage **83** by moving it to the appropriate position wherein the second hole of the series (reading from right to left in Fig. 6) is in registry with the pin **98** and permitting the pin to enter the hole, and to move the adjusting screw **118** to a position wherein the 0.120 index is indicated. This latter adjustment is attained by a clockwise movement of the adjusting screw which feeds the adjusting screw inwardly of the carriage. The end of the adjusting screw thus bears against the end of the indexing bar **94** and draws the carriage forwardly the desired 0.060 inch distance. The grinding of the lining L on the 5.060 inch radius may then take place in the manner previously described by oscillation of the rod **226** from side to side.

From the above description, it will be noted that the indexing bar effectively becomes a part of the carriage when the bar moves with the carriage in initially adjusting the carriage according to the positions determined by the holes **95**; and it effectively becomes a part of the base when it is locked by the pin **98** and the carriage is adjusted relative to the indexing bar by means of the adjusting screw **118**.

The device of the present invention provides convenient means for forming a bevel on each end of the brake shoe lining by a simple manipulation of the operating rod **226** and without changing the setting of the carriage **87**. To form such bevel, the operating rod is raised out of engagement with the half-nut and the carriage **87** swung to a position wherein one end of the brake shoe lining is opposite the grinder **47**. By appropriate manipulation of the rod **226**, the holder **88** is then moved rearwardly without swinging movement to push the end of the brake shoe lining against the surface of the grinder **47** and thereby grind a bevel on the end of the lining. The holder **88** is then backed off and swung to a position to bring the other end of the lining opposite the grinder whereupon the beveling operation is repeated in respect to that end of the lining.

From the foregoing it will be seen that the present invention provides a grinding device which is especially well adapted for grinding lined brake shoes to true arcuate contour, which is simple in construction, and which may be made economically. At the same time, however, the device is rugged and sturdy and can be used for a long period without likelihood of breakage of parts and without the necessity of replacing parts.

I claim:

1. A grinder comprising a base, a grinding element supported on the base, a carriage mounted on said base for sliding movement toward and from said grinding element, a holder for an article to be ground mounted on said carriage, an indexing bar slidable on said base and engaging said carriage, for positioning the latter on said base locking means mounted in said base for movement into and out of locking engagement with said indexing bar in any of a number of positions of the indexing bar, said locking means having a recess therein detent means, and means resiliently urging said detent means into engagement with said locking means, said detent means registering with said recess in said locking means in the non-locking position of the latter and operative for releasably retaining said locking means out of locking position.

2. A grinder comprising a base, a grinding element supported on said base, a carriage means supported on said base, a holder for an article to be ground supported on said carriage means, said carriage means being slidable on the base toward and from said grinding element and having a plurality of locking elements spaced longitudinally along the line of its movement, locking means mounted in said base for movement into and out of locking engagement selectively with said locking elements according to the adjusted position of said carriage means, spring means biasing said locking means toward the position of locking engagement, said locking means having a recess therein detent means, and means resiliently urging said detent means into engagement with said locking means, said detent means registering with said recess in said locking means in the non-locking position of the latter and operative for retaining said locking means out of locking position against the action of said spring means, said recess in said locking means and said detent means including cooperating camming surfaces effective for moving said detent means to releasing position in response to pressure applied to said locking means in excess of that exerted by said spring means in the direction of locking engagement.

3. Locking means for a device having a base and a member mounted on the base for sliding movement thereon, comprising a plurality of locking elements on the movable member at predetermined spaced locations along the line of movement, a plunger mounted in said base for sliding movement in directions transverse to the line of movement of the movable member into and out of engagement selectively with said locking elements for locking the movable member in adjusted position, spring means biasing said plunger toward locking position, said plunger having a recess in its periphery, detent means mounted in said base for sliding movement into and out of position engaging the surface of said recess, and spring means biasing said detent means toward its said position, said detent means and two opposite surfaces of said recess having interengageable camming surfaces operative for moving said detent means out of said recess in response to a force applied to said plunger in either direction in excess of the holding force exerted by the first spring means.

4. A grinder comprising a base, a carriage mounted on the base for sliding movement thereon, an indexing bar slidable on said base and engaging said carriage for positioning the latter on said base, said bar having a plurality of holes extending transversely therethrough at predetermined spaced intervals along the line of movement of the carriage, said holes having outwardly diverging surfaces on one side of the bar, a pin slidably mounted in said base on one side of the indexing bar, having a tapered end engageable selectively with the diverging surfaces of said holes and operative for locking said carriage against movement, a ball mounted in said base on the other side of the indexing bar in alignment with said pin for movement into and out of engagement selectively with the edges of said holes and being dimensioned relatively to the holes so as to extend thereinto a slight extent and present surfaces in engagement with the edges of the holes of such inclination as to enable the ball to be forced out of the holes in response to movement of the carriage, and spring means biasing said ball toward the index bar.

5. A device of the character disclosed comprising a base, a carriage slidably mounted on said base, said carriage having an element extending along its line of movement provided with a plurality of holes spaced longitudinally therealong at predetermined intervals, said base hav-

ing a cavity and an aperture through a wall of the cavity adapted to align selectively with said holes according to the position of the carriage, a ball in said aperture of greater diameter than the holes, longitudinally spaced pins in the cavity positioned on opposite sides of said aperture, and a leaf spring interposed between said pins and ball and operative for biasing the ball toward the said carriage element having said holes.

6. A grinding device comprising a base, a grinding element mounted on said base, a carriage mounted on said base for sliding movement toward and from said grinding element, an indexing bar mounted in said base for sliding movement relative to said base and to said carriage, means mounted in said base for releasably locking said indexing bar in any of a number of predetermined positions, means normally retaining said carriage in engagement with said indexing bar for movement therewith, and means for adjustably moving said carriage relatively to said indexing bar, said last means comprising an element on said carriage having an axially extending zero indicia mark and axially spaced graduated indicia marks, a screw threadedly mounted in said carriage in engagement with said indexing bar, a knob threadedly mounted on said screw and having indicia means with a circumferentially extending indicia mark and circumferentially spaced indicia marks, said knob being adjustable axially of said screw, and said indicia means being adjustable rotationally of the knob in fixed position axially thereof.

7. A grinding element comprising a spindle adapted for rotational mounting, a cylindrical inner sleeve of relatively rigid, resilient material having a longitudinal slot enabling limited expansion thereof in radial direction and thereby having a normal diameter and an expanded diameter, a seamless abrasive sleeve surrounding said inner sleeve of a diameter within the limits of diametrical dimensions of the inner sleeve, and a pair of end members mounted on the spindle having camming surfaces on their

inner ends for engaging the inner sleeve and expanding it into direct frictional engagement with the abrasive sleeve throughout the length of the latter, cylindrical surfaces axially outwardly of said camming surfaces, and radial shoulders axially outwardly of said cylindrical surfaces engageable with the ends of the sleeves, said spindle extending through one of said end members, and the other end member having a recess receiving an end portion of the spindle, and screw means extending through said other end member and threaded into said end of the spindle, said screw means having a head engaging the outer surface of the end member and a shoulder engageable with the inner surface of the end member for positively removing the end member from the assembly in response to removal of the screw means from the spindle.

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