B. L. MALLORY.

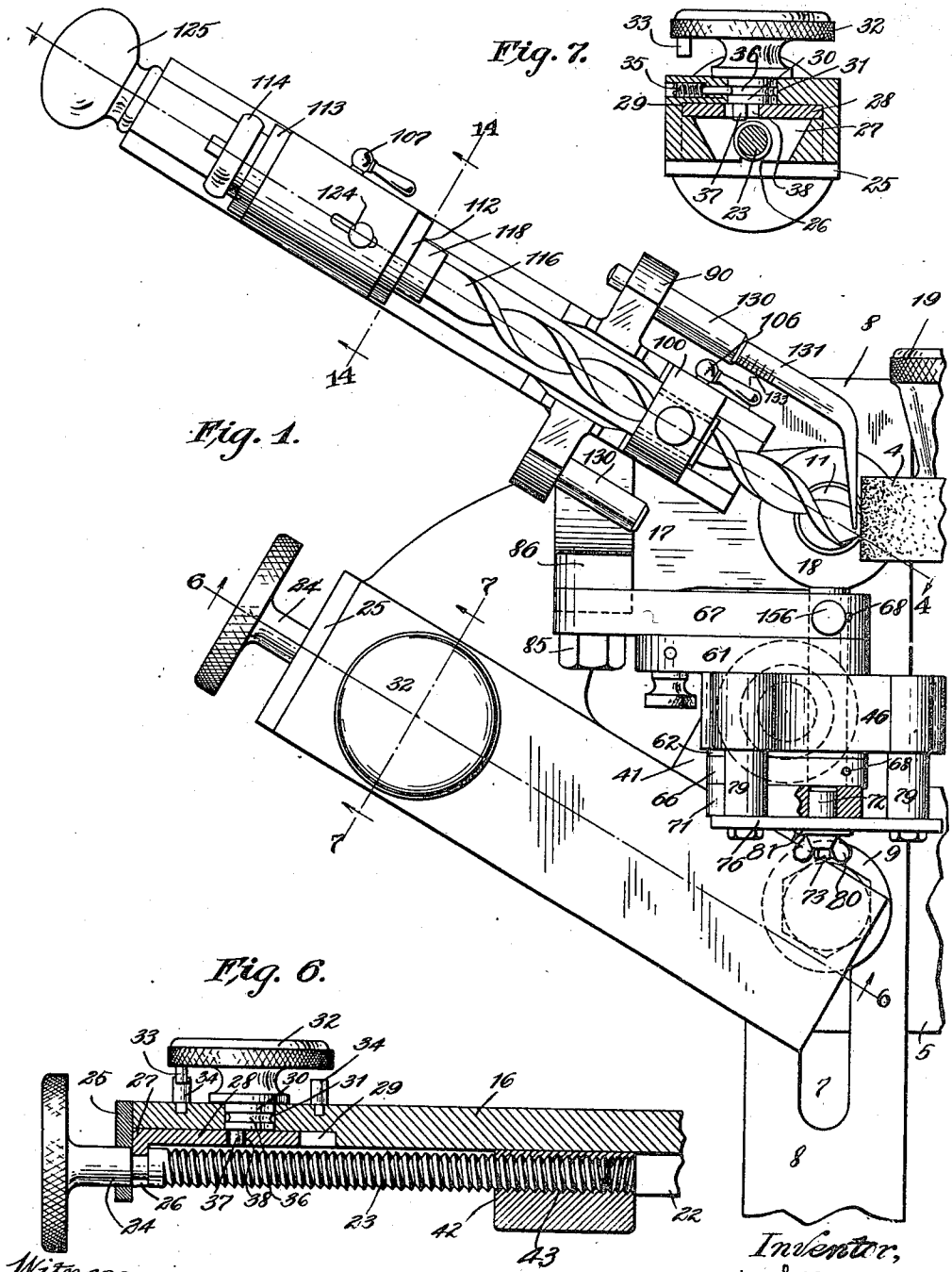
TOOL GRINDING ATTACHMENT.

APPLICATION FILED OCT. 16, 1914.

1,195,248.

Patented Aug. 22, 1916.

5 SHEETS—SHEET 1.



Witnesses:
R. L. Bruck.
H. J. Quall.

Inventor,
Bonnie L. Mallory
By Hull and Smith
Attys.

B. L. MALLORY.

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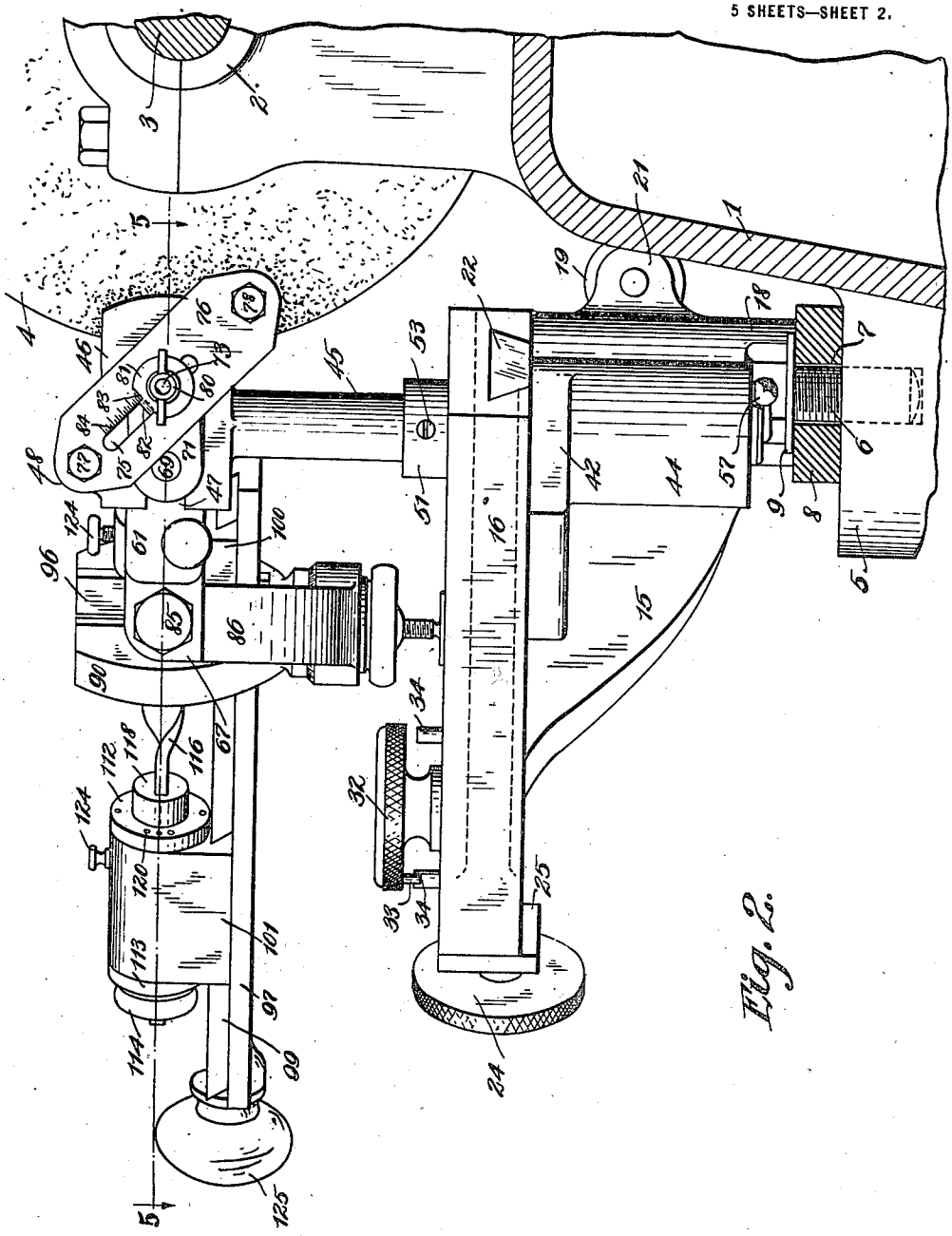


Fig. 2.

Witnesses:
R. L. Bruck.
H. J. Quall.

Inventor,
Bonnie L. Mallory
By Hull & Smith
Attys.

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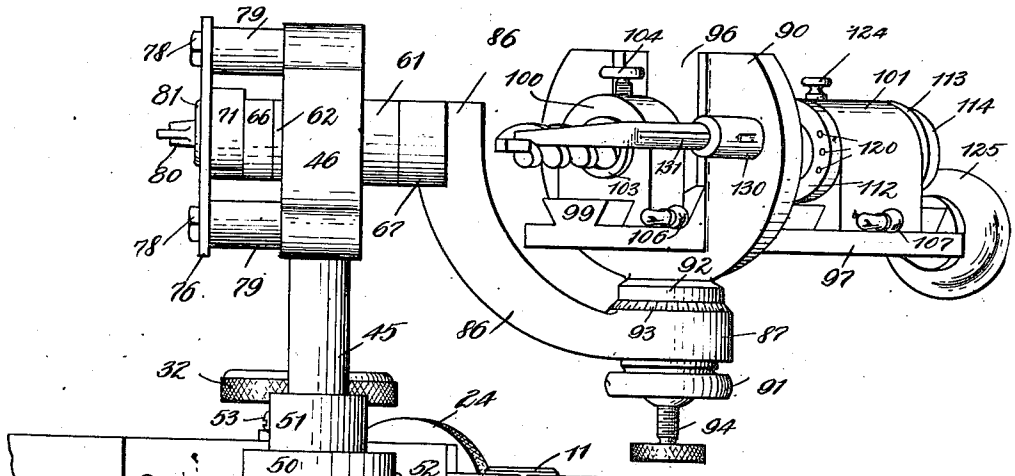


Fig. 3.

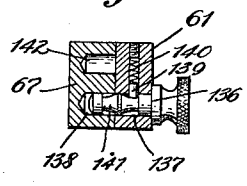


Fig. 10.

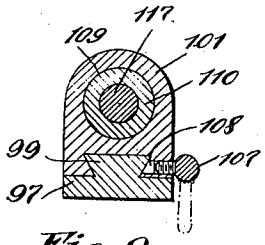


Fig. 9.

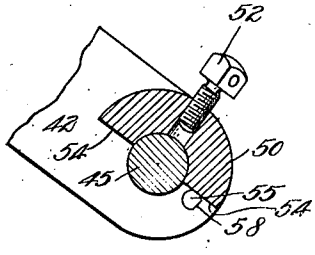


Fig. 8

Witnesses:
R. L. Bruck.
H. J. Quall.

Inventor,
Bonnie L. Mallory
By Hull and Smith
Attys.

B. L. MALLORY.

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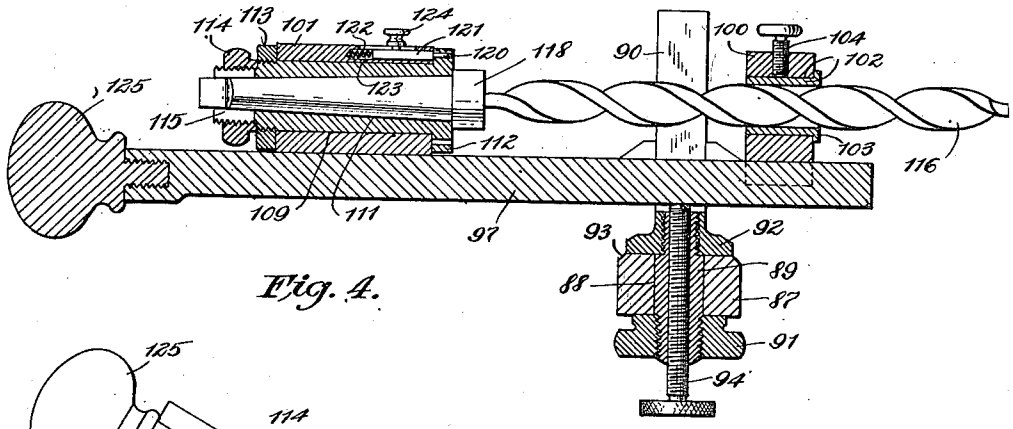


Fig. 4.

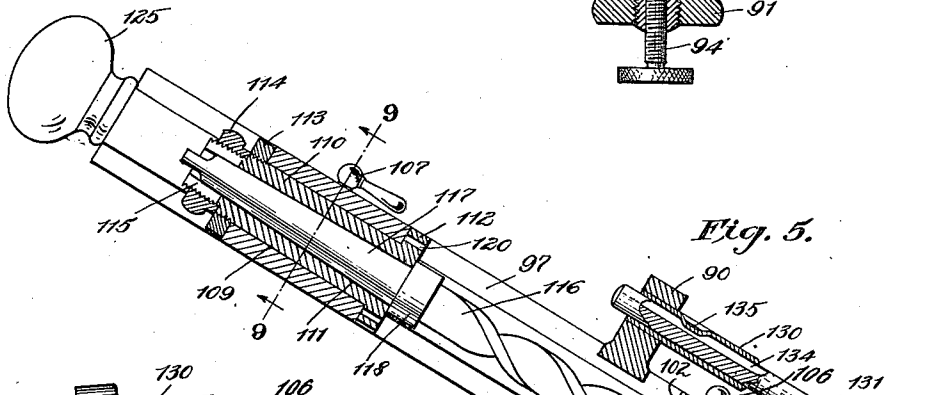


Fig. 5.

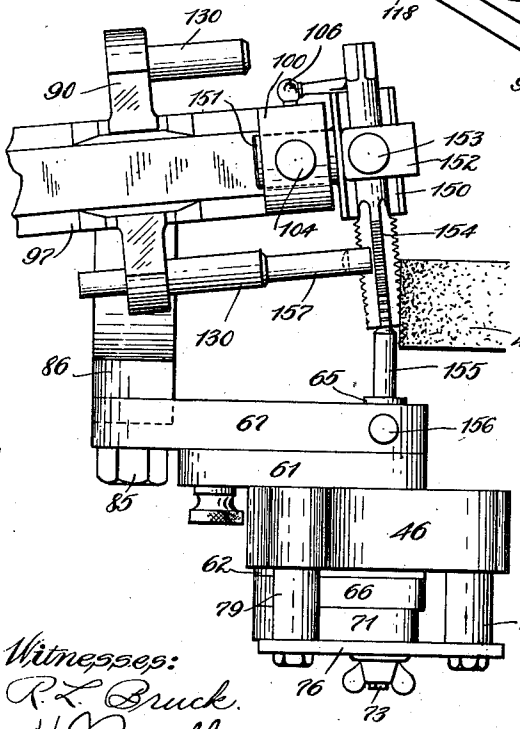


Fig. 16.

Witnesses:
R. L. Bruck.
H. J. Ruall.

Inventor,
Bonnie L. Mallory
By Hull and Smith
Attys.

B. L. MALLORY.

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5 SHEETS—SHEET 5.

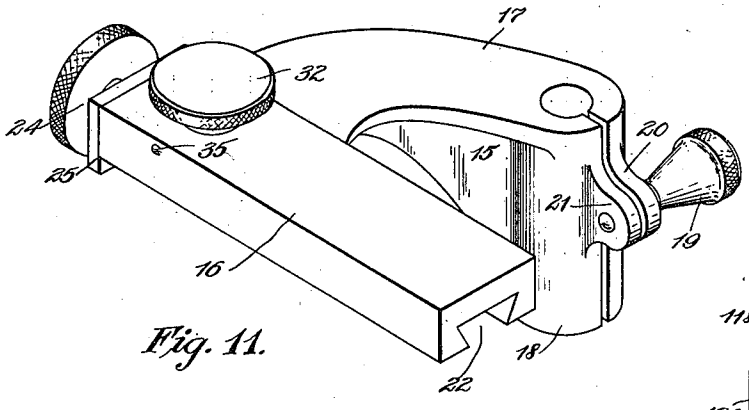
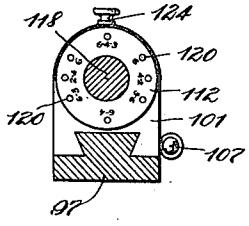


Fig. 11.

Fig. 14.



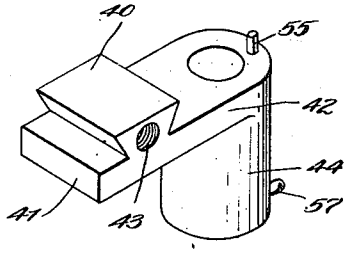


Fig. 12.

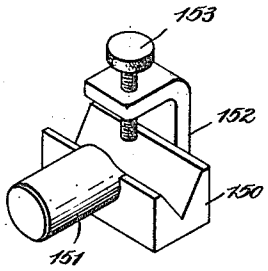


Fig. 15.

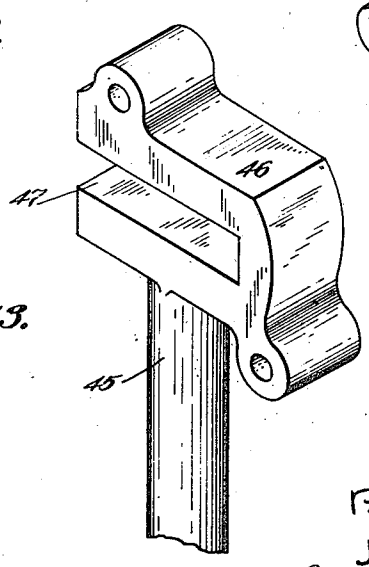


Fig. 13.

Witnesses:
R. L. Bruck.
H. J. Duall.

Inventor,
Bonnie L. Mallory
By Hull & Smith
Attys.

UNITED STATES PATENT OFFICE.

BONNIE L. MALLORY, OF CLEVELAND, OHIO.

TOOL-GRINDING ATTACHMENT.

1,195,248. Specification of Letters Patent. Patented Aug. 22, 1916.

Application filed October 16, 1914. Serial No. 866,932.

To all whom it may concern:

Be it known that I, BONNIE L. MALLORY, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Tool-Grinding Attachments, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

This invention relates to tool grinding attachments for abrading devices.

It has for its object to provide an instrument that can be readily applied to the stands of practically all types of abrading devices, such as emery wheels, and which will support a tool in correct relation thereto and properly guide the same in its movements during the grinding operation, whereby an unskilled person is enabled to perform the work of an expert.

A further object of my invention is to provide an instrument of the above nature which will accommodate various kinds and sizes of tools, and which may be used for grinding either right or left hand drills, taps, reamers, etc.

In order to obtain a clear understanding of the principles and operations of my tool grinding attachment, it will be well to first consider the results sought for.

It is well known to those familiar with the kind of tools wherewith my attachment is adapted for use, that the metal to the rear of the cutting edge of the tool must recede therefrom. This constitutes what is known in the art as the "clearance" of the tool. Therefore the first requirement of the attachment is that it present the tool to the abrading device at the correct angle, and guide it properly in its movements across the abrading surface so as to produce the aforesaid clearance. Now it is essential that the amount of clearance vary in accordance with the density of hardness of the object upon which the tool is intended to operate. For example, where the object is very hard, the clearance is comparatively slight in order that there will be enough material left just back of the cutting lip to sufficiently reinforce and strengthen the same. Where the object is comparatively soft, the reverse of this condition is required. From this it will be seen that an adjustment is necessary whereby the attachment may be caused to produce varying degrees of clearance, as it guides the tool in operative relation to the abrading surface.

It may be stated, therefore, that the general object of my invention is the provision of a device which is substantial in construction, convenient of operation, and whereby the above ends may be accomplished in a simple and expeditious manner.

An embodiment of my invention is illustrated in the accompanying drawings wherein—

Figure 1 is a plan view of my tool grinding attachment applied to the stand of an emery wheel, a portion of the stand and a fragment of the wheel being included in said figure; Fig. 2 is a sectional view through the emery wheel stand, and showing the tool grinding attachment in side elevation, the same being viewed from the near side of Fig. 1; Fig. 3 is what may be considered a front elevation of the tool grinding attachment as it appears from the emery wheel side, a portion of the emery wheel stand being shown in section in said figure; Fig. 4 is a central longitudinal section through the tool supporting table and adjacent parts of the attachment, the plane of the section being indicated by the line 4—4 of Fig. 1; Fig. 5 is a horizontal section through the attachment on the line 5—5 of Fig. 2; Figs. 6 and 7 are a longitudinal and a transverse section through the head of the supporting bracket, the same being indicated by the lines 6—6 and 7—7 of Fig. 1; the respective views showing the parts in slightly different positions; Figs. 8, 9 and 10 are sectional details corresponding, respectively to the line 8—8 of Fig. 3 and the lines 9—9 and 10—10 of Fig. 5; Fig. 11 is a perspective view of the supporting bracket; Fig. 12 is a similar view of the post carrier; Fig. 13, a perspective of the post; Fig. 14 is a transverse section through the tool supporting table, just forward of the rear tool support, and showing the same in front elevation (see line 14—14, Fig. 1); Fig. 15 is a perspective of a tap supporting device for use with my grinding attachment; and Fig. 16 is a partial plan view of the attachment, showing the tap supporting device applied thereto, and illustrating the method of grinding a tap.

Taking up a detailed description of the

invention by the use of reference characters, 1 represents the stand of an emery wheel of common type, above which is supported in suitable bearings 2, the shaft 3, to the end of which is attached the emery wheel 4. Projecting from each side of the front of the stand 1 is a lug 5, only one of such lugs being shown in the drawings. Each lug is provided with a threaded aperture for the reception of the screw 6 which passes through a slot 7 in a bar 8, which bar may be thereby firmly clamped to said lugs, a washer 9 being interposed between the head of each screw and the upper surface of the bar. The end of the bar 8 has an aperture 10 within which is fastened the reduced lower end of an arbor 11, by means of the pin 12. Because of the adjustable connection between the bar 8 and the lugs 5, provided by the slots 7, said bar may be moved laterally with respect to the emery wheel stand until the arbor 11 is located substantially in front of the transverse center of the emery wheel 4, where it may be securely held by the screws 6.

The supporting bracket 15, that is shown in perspective in Fig. 11, comprises a head 16 and a curved arm 17, which extends from one side of one end of the head 16, said arm 17 having a split, cylindrical, hollow boss 18 depending from its end opposite the head 16 for application to the arbor 11. By means of a knurled headed screw 19, which passes freely through a lug 20 and is threaded into a lug 21, that projects from the adjacent edges of the split side of the boss 18, the bracket may be firmly clamped to the arbor 11 in any angular position with respect thereto. The underneath side of the head 16 is provided with a dove-tail groove 22 into which extends a screw 23 that has a smooth portion 24 which is journaled within a plate 25, secured to the rear end of the head 16. Between the smooth portion 24 and the threaded portion of the screw, there is a circumferential groove 26 that is contained within a notch formed in the vertical wall 27 of a slide 28 that is guided within a channel 29 formed in the top wall of the dove-tail groove 22, adjacent the rear end of the head 16. A stub shaft 30 occupies a bore 31 which passes through the head 16 above the channel 29, and is adapted to be oscillated in either direction by its knurled head 32, until the stop 33, which depends from the underneath surface of the head 32, engages either one of the stationary stops 34 that rises from the head 16. The stub shaft 30 is retained within the bore 31 by a set screw 35 which passes through the side of the head, and the end of which occupies the circumferential groove 36 in the stub shaft. A pin 37 projects from the lower end of the stub shaft 30 and is eccentric with respect thereto. This pin occupies a transverse slot 38 in the slide 28. Therefore, it will be seen that, upon the turning of the shaft 30, the slide 28 will be reciprocated within the channel 29 to move the screw 23 longitudinally of the head 16.

Adapted to occupy the dove-tail groove 22 of the head of the supporting bracket is a correspondingly shaped lug 40 which rises from the lateral arm 41 of the post carrier 42, shown in perspective in Fig. 12. The lug 40 is tapped at 43 for the reception of the screw 23. Upon the turning of the screw 23, therefore, the post carrier 42 will be moved longitudinally of the head 16, or both the screw and post carrier may be reciprocated through the operation of the stub shaft 30. The purpose of the adjustments thus provided will become apparent later on in this description.

The body portion of the post carrier 42 comprises a hollow cylindrical boss 44, for the reception of the lower end of the post 45 which, it will be seen upon referring to Fig. 13, particularly, has a head 46 that is provided with a horizontal guideway 47. A transverse boss 48 rises from one end of the top, and a similar boss 49 depends from the opposite end of the bottom of the head 46, for a purpose which will become apparent later on. A stop collar 50 and a thrust collar 51 are adapted to be fastened, in any adjusted position, to the post 45 by means of their respective set screws 52 and 53. The stop collar 50 has its lower half cut away through substantially 180°, as shown in Figs. 3 and 8 each end of the cut away portion forming a shoulder 54 which is arranged to engage a stop pin 55 that is journaled within a vertical bore 56 of the boss 44. The lower end of the stop pin 55 protrudes beyond the bottom plane of the aforesaid boss and is there provided with an operating handle 57, whereby said pin may be turned. It will be observed, particularly from Fig. 8, that the upper end of the pin has a flattened side 58 that is adapted to be engaged by one of the shoulders 54, when the pin is turned so as to present the flattened side thereto. Otherwise the said shoulder 54 strikes against the curved side of the pin. The reason for the adjustment of the collars 50 and 51 upon the post 45, and the eccentricity of the upper end of the pin 55 will be explained hereinafter.

Slidable within the guideway 47 of the head 46, that is carried by, and preferably formed integral with the upper end of the post 45, is a slide or block 60 which has an enlargement 61, that overhangs the edges of the guideway 47 on the inner side of the head, and which has applied to its outer face, a plate 62, which maintains the block 60 straight within the guideway by bearing upon the outer face of the head 46, along each edge of the guideway.

Journaled within a transverse bore 64 of the block 60, is a hollow rock-shaft or sleeve 65, which has attached to its outer end a link 66, and to its inner end an arm 67. The link and arm are prevented from turning upon the ends of the sleeve 65, by the pins 68 which pass downward through the respective arm and link and occupy straight transverse grooves in the side of the sleeve 65. When the arm 67 is rocked, therefore, the link 66 will be rocked likewise. The rear end of the link 66 carries a pin 69 a portion of which occupies an aperture 70 in the link 71. The links 66 and 71 are of substantially the same size and shape, and the forward end of the link 71 has an aperture 72 which, when the links 71 and 66 are parallel, is in axial alinement with the sleeve 65 whereon the link 66 is mounted, and about which said link oscillates. The cylindrical head of a screw 73 occupies the aperture 72, and said screw is adapted to be locked at any desired point along a diagonal slot 75 of a plate 76, which is supported by the screws 77 and 78 that are threaded into the bosses 48 and 49 of the head 46, the plate being spaced from the side of the head by the spacers 79. The locking of the screw 73 within the slot 75 is effected by a thumb nut 80, that is threaded upon the screw and between the inner face of which and the adjacent surface of the plate 76, there is a washer 81, having a tongue 82 which projects into the slot 75, thereby preventing the washer from turning upon the screw. The tongue 82 is formed by cutting material away from each side thereof and thereby producing straight edges 83 on the washer adjacent each lateral edge of said tongue, and one of these straight portions is adapted to coöperate with the graduations 84 that extend along one side of the slot.

Secured to the rear end of the arm 67, by means of the screws 85, is a curved supporting member 86, which terminates at its lower end in a horizontally disposed flat circular boss 87. As will be seen most clearly from Fig. 4, this boss is provided with a central vertical bore 88 through which extends a stud 89 that is attached to the lower end of what I will term a turret 90, preferably by having its upper end reduced and threaded thereinto. The lower end of the turret 90 is circular and has a smooth underneath surface for engagement with the smooth upper surface of the boss 87, and the turret is adapted to be clamped to the boss 87, in any adjusted angular position with respect thereto, by the knurled nut 91 which is threaded upon the lower end of the stud 89, and is arranged to bear against the underneath side of the boss 87. The relative angular position of the turret, with respect to the boss 87, is indicated by the index mark 92 of the turret and the graduations 93 that are borne by the adjacent edge of the boss 87.

The stud 89 has a central bore that is threaded for the reception of an adjusting screw 94 which extends up through said stud into the guideway 96 of the turret. A tool supporting table 97 is supported by the turret 90 and is slidable within its guideway 96, the sides of the table having vertical channels 98 for coöperation with the sides of the guideway 96. The table rests upon the upper end of the adjusting screw 94 and may be reciprocated within the guideway by the turning of said screw. A rail 99 that is dove-tail shape in cross section, extends longitudinally along the upper side of, and is preferably formed integral with the table 97 and serves as means of attaching the front and rear tool supports 100 and 101, respectively, to the table. The forward tool support 100 comprises the body portion to which the numeral 100 is applied and has a bore 102 for the reception of a bushing 103 that is held in place by means of a set screw 104. Bushings of various internal diameters are intended to be used in connection with the tool support, to accommodate drills of corresponding diameters. The bottom of the body portion 100 is provided with a dove-tail channel for coöperation with the rail 99, and the support is adapted to be locked in different adjusted positions therealong by the screw 106, which is threaded through the side of the support.

The body portion of the rear tool support 101 is quite similar to that of the forward tool support, the same having a dove-tail channel for coöperation with the rail 99. The support 101 may be locked to the rail by means of the set screw 107, which passes through the side of the body portion of the support, near its lower edge, as clearly shown in Fig. 9, a block 108 of comparatively soft material, such as brass, being interposed between the end of the screw and the side of the rail, to prevent marring the latter. This same idea is carried out in connection with the screw 106 of the forward tool support, and in other parts of the mechanism, where such is desirable. The central bore 109 of the rear support contains a bushing 110 having a tapered bore 111 for the reception of a shank of a drill. The forward end of the bushing is provided with a lateral flange 112 which bears upon the front end of the body portion of the support, and the rear end of the bushing is threaded for the application of a nut 113, whereby the bushing is retained within the bore of the support. As will be observed particularly from Figs. 4 and 5, the extreme rear end of the bushing 110 is provided with a tapered thread for the application of the knurled nut 114, and this end of the bushing, it will be noted, is split at 115. By this

means, the shank of a drill may be securely clamped within the bushing.

Although my attachment is adapted to the sharpening of all kinds of boring tools, I have shown it herein as supporting what is generally known as a high speed drill, the same comprising the helical portion 116 and the tapered shank 117 which are separated by a collar 118. In this type of drill, the shank and collar are usually formed of an integral piece of material, and the twisted portion is formed from a flat piece of metal, properly twisted into a helix, and then set into the shank. Consequently, these drills are often found to be untrue, that is to say, their rotating axis is not always coincident with the axis of the helix. It will be appreciated from this that it is quite difficult to accurately sharpen drills of this character, although by the use of my improved attachment absolute accuracy may be obtained, and the operation reduced to one of extreme simplicity. It will be further stated that high speed drills of the above character are made with either two, three, four or six cutting lips, the one shown herein having but two.

I have previously stated that the shank of the drill may be firmly clamped within the bushing 110, and it is clear from the construction of the rear tool support that the bushing 110 is rotatable therein. It will be observed that the lateral flange 112 of the bushing is provided with a series of apertures 120 for the reception of the forward reduced end of a plunger 121 which is contained within a bore 122, formed in the top wall of the support 101, and is pressed toward the aforesaid flange 112 by a spring 123, the plunger being provided with a knob 124 whereby it may be retracted against the tension of the spring and withdrawn from the apertures 120 of the flange. From Fig. 14 it will be seen that there are six apertures 120, and that two diametrically opposite ones bear the numeral 2. These are used when operating upon a drill having two lips. The bushing is set with the plunger occupying one of the apertures marked "2" and the shank of the drill is clamped within the bushing with one of its lips horizontal, which is the proper position for grinding. When the first lip has been treated, and it is desired to grind the other, the plunger 124 is withdrawn from the aforesaid aperture and the drill is rotated until the other aperture marked "2" is in register with the plunger 121, when said plunger will be projected into the aperture to hold the parts in position for the grinding of the second lip. It will be seen from this that both lips will receive precisely the same treatment, and that the line of demarcation between the two must be coincident with the rotating axis of the drill. When operating upon drills having three lips, the apertures 120 which are correspondingly marked are used, and likewise when grinding drills having four or six lips. An operating handle or knob 125 is shown as attached to the rear end of the table 97 for a purpose which will be brought out during the description of the operation of the attachment.

Carried by the turret 90, on each side of its guideway 96, is a sleeve 130 which extends through the turret and projects some distance forward therefrom. These sleeves are adapted to receive the shank 131 to a gage finger 132 which is used for determining the correct location of the lip of the drill that is to be ground. In Fig. 5, this gage finger will be seen as overlying the lip of the drill, and its shank is provided with a series of graduations 133 which coöperate with the forward end of the respective sleeve 130 to determine the correct position of the gage with respect to the turret. A keyway 134 is formed in the side of the shank 131 and receives what is, in effect, a key 135, the same being preferably formed by forcing a portion of the material of the sleeve 130 inwardly, such portion being of substantially the same width as the keyway 134. By this means, the gage finger is prevented from turning with respect to the sleeve and assures the correct adjustment of the drill.

While setting a drill or other tool for the purpose of grinding the same and adjusting the various parts prior to the operation of the mechanism, the tool supporting table is maintained in a horizontal position by locking means which comprises the slide bolt 136, shown in detail in Fig. 10. This bolt is reciprocable within a transverse bore 137, formed in the lower rear corner of the enlargement 61 of the block 60, and when the parts are in the aforesaid position the end of the bolt occupies a recess 138 that is formed in the arm 67. The bolt is held in its inner or outer position by means of a spring plunger 139 which occupies a vertical bore 140 in the enlargement 61, the bolt having circumferential grooves 141 for the reception of the end of said plunger. It will be noted that the opposed sides of the two grooves are substantially perpendicular to the longitudinal axis of the bolt, while the bottoms of said grooves are inclined at a comparatively slight angle with respect thereto, and merge at the adjacent sides into the outer surface of the bolt. By this arrangement, the bolt can be easily moved so as to bring either of its grooves into register with the plunger, but in the case of the groove nearest the end of the plunger, its straight side will engage the plunger and prevent the entire withdrawal of the bolt from the bore 137. The purpose of the sec-

ond recess 142, that is formed in the arm 67 above the recess 138, will be explained farther along in the description.

When the drill has been placed within the supports 100 and 101, and its lip has been properly located by means of the gage finger 132, the shank of the drill is clamped within the bushing 110 by tightening the nut 114. The tool supporting table is then adjusted vertically by means of the screw 94 until the axis of the drill is in the horizontal plane of the axis of the sleeve 65. The post 45 is thereafter adjusted vertically within its carrier 44 until the lip of the drill is slightly (approximately one sixteenth inch, in practice) above the horizontal center of the abrading wheel. The post is maintained at this elevation by locking the thrust collar 51 to the post, by means of its set screw 53. The post is then set within its carrier so that its head will be in substantially a parallel plane with the wheel. The stop collar 50 is now rotated upon the post 45 until one of its shoulders 54 is in engagement with the pin 55, the latter being turned so as to present its flattened side 58 to such shoulder. In this position the collar is securely locked to the post by means of its set screw 52. Care should be taken in the adjustment of the collar 50 to have the cut away side thereof facing in the direction of the emery wheel, so that the post 45 may turn within the carrier 44 in a direction to remove the drill from the abrading wheel. With the parts thus adjusted, the turret 90 may now be rotated upon the supporting member 86, until the appropriate one of the graduations 93 is selected by the index 92, to indicate that the lip of the drill will be parallel to the working surface of the abrading wheel when the same is swung thereagainst. In this position the turret is clamped by the nut 91.

Attention is called to the fact that the tool supporting table and the head 16 of the supporting bracket should be substantially parallel, as shown in Fig. 1; and that the head 46 should be substantially parallel to the plane of the abrading wheel, as aforesaid.

With the parts adjusted as above described the operation is as follows:—The operator grasps the knob 125 and withdraws the bolt 136 from the arm 67. He then swings the rear end of the tool supporting table up and down, which rocks the arm 67, by reason of its connection therewith through the supporting member 86 and the turret 90. Upon the rocking of the arm 67, the link will be caused to rock in like manner, because of its connection with the arm through the sleeve 65. Also, the downward movement of the rear end of the link 66 will cause a similar movement of the link 71 upon its pivot or screw 73; but because of the fact that the screw 73 occupies a position above the plane of the sleeve 65, the arcs described by the rear ends of the links 66 and 71 will have different centers, the center whereon the link 71 rotates being defined by the screw 73, while that upon which the link 66 swings is defined by the sleeve 65. Since the rear ends of the links 66 and 71 are positively pivoted together by means of the pin 69, the swinging of the links will result in the link 66 being moved bodily forward, whereupon the block 60 will be slid within the guideway 47, and all of the parts carried thereby will be moved in the direction of the abrading wheel. It will be obvious from this that the clearance of the drill is obtained by this advance movement of the drill toward the abrading surface while the same is being oscillated upon the axis defined by the center of the sleeve 65, which axis, it will be noted, is parallel to the abrading surface. To adjust the drill for the sharpening of its other lip, the table may be returned to its horizontal position and held there by the bolt 136, and the parts may be moved away from the abrading wheel by swinging the post 45 within its carrier 44. After the plunger 121 has been withdrawn from the aperture within the flange 112, and the drill has been turned over until the plunger is brought in position to occupy the opposite aperture thereof, the parts may be moved again toward the abrading device until the shoulder 54 of the stop collar engages the pin 55, after which the operation above described is repeated.

It is known to those familiar with the design of twist drills, that the surfaces which represent the "clearance" to the rear of the cutting lips or edges, merge at the center of the drill and define a line which connects the inner ends of the lips. Because of the convexity of the "clearance" portions, the aforesaid line is also slightly curved outward and, in the operation of the drill, bears directly against the object that is to be acted upon by the drill. It is obvious that this bearing of the point of the drill upon the object results in inefficiency in the operation of the drill, which is estimated to be substantially that of seventy-five per cent. In other words, seventy-five per cent. of the power which is consumed in the drilling operation is taken up in forcing this "dead" point of the drill into the material. It has been the practice heretofore in the sharpening of drills by hand, to ignore this detrimental feature, although the same may be obviated by "spotting" the point of the drill. By "spotting" the point of the drill is meant the grinding away of the inner parts of the "clearance" portions of the drill in order to cause the line which divides said portions to curve inward rather than outward, as formerly described. This leaves the extreme

inner ends of the cutting lips as the points which will first contact with the object to be drilled, thereby eliminating the aforesaid detrimental feature. I have incorporated within my attachment means for accomplishing this same result of "spotting" the point of the drill.

In the operation of "spotting" the drill, the slide bolt 136 is withdrawn from the recess 138 of the arm 67, and said arm, with the parts carried thereby, is permitted to drop until the recess 142 is in register with said bolt, when said bolt may be returned to effective position and hold the parts in such position. This swings the drill upon the center defined by the sleeve 65, until the central part of the "clearance" portion of the drill is substantially horizontal or in a position to be presented to the abrading surface. The stop pin 55 is next turned by means of its operating handle 57, to bring its curved side opposite the shoulder 54 of the stop collar. This prevents the parts from swinging quite as far in the direction of the emery wheel as they previously did and, at the same time changes the angle between the lip of the drill and the abrading surface. Now in order to move the drill supporting parts toward the abrading wheel so that the drill may be brought into contact therewith, I provide the stub shaft 30, which may be turned by its head 32, and move the slide 28, the screw 23, and the post carrier 44, with all of the parts supported thereby, bodily toward the abrading wheel. Now as the parts are rotated with the post 45 toward the abrading wheel, the "clearance" portion of the drill will be brought into contact with the abrading surface, at an angle which will cause only its inner part to be effected, and thereby concave that portion of the drill on an arc corresponding to the circumference of the wheel. When both "clearance" portions are so treated, the line dividing them will curve inward as desired.

I have previously referred to the device for application to my attachment, that is used in the grinding of taps. This device, as will be seen clearly from Figs. 15 and 16 comprises a trough 150 from one side of which projects a cylindrical boss 151, and from the other side of which rises an arm 152 which overhangs the trough 150, and through the upper, horizontal portion of which is threaded a set screw 153. The shank of a tap 154 may be clamped within the trough 150, by means of the screw 153, the lower end of which is brought to bear directly against the shank of the tap. The trough is applied to the attachment by means of the boss 151 which is placed within the bore 152 of the front tool support 100 and is held therein by the set screw 104. To properly adjust the tap with respect to the center of the sleeve 65 whereon the tap oscillates, I provide a point 155 that may be slipped into the sleeve 65 and held therein by a set screw 156 in a position to be engaged by the center of the end of the tap. To gain this position, it is obvious that the tool supporting table may be adjusted by the screw 94 until the proper elevation is obtained, and that the tap may be adjusted longitudinally within the trough 150, prior to the tightening of the screw 153. Just before the tightening of this latter screw, the tap is also adjusted to its proper angular position within the trough, which may be determined by a gage finger 157 that is placed within one of the sleeves 130, the forward end of the gage finger 157 having its underneath side flattened for coöperation with one of the flutes of the tap. The turret 90 is swung upon the supporting member 86 until the side of the tap is at the proper angle to the abrading surface, which represents the "lead" desired. Now, upon the oscillation of the table 97, the tap will be presented to the abrading wheel and guided in its movements across the same in a manner that will produce the desired clearance, in the same manner as has been previously explained in connection with the grinding of a drill.

My attachment is shown in the drawings as being arranged for the sharpening of right-hand drills and taps. To change it for the grinding of left-hand drills, taps, reamers, etc., the supporting bracket is loosened from the arbor 11 and is swung about the same until the head 16 thereof occupies a position on the opposite side of the abrading wheel corresponding to that which it occupies in the drawings. The screw 23 is then rotated to slide the post support into substantially the same position, with respect to the abrading wheel, as it formerly occupied on the opposite side thereof. The supporting member 86 is detached from the arm 67 by the removal of the screw 85, and the block 60, with the parts carried thereby, are removed from the guideway 47 and are turned over and replaced within the guideway with the arm 67 extending in a direction away from the abrading wheel, precisely as they did in the former instance. The supporting member 86 is turned to the opposite side of the turret 90 and is attached to the arm 67. Thus assembled, the mechanism is in readiness to operate with left hand drills, taps and the like.

Having thus described my invention what I claim is:—

1. In a tool grinding attachment for abrading devices, the combination of a member movable toward and away from the abrading surface, a tool support pivotally connected therewith, a link, a pivotal support for one end of the link which is adjustable transversely of the direction of movement of the

first mentioned member, and connections between the tool support and the free end of said link whereby the oscillation of the support will cause said link to move the first mentioned member.

2. In a tool grinding attachment for abrading devices, the combination of a member movable toward and away from the abrading surface, a rock shaft supported by said member, a tool carrier angularly fixed with respect to the rock shaft, a link rigid with the aforesaid rock shaft, a second link that is pivoted to the free end of the former link, and a pivotal support for the opposite end of the latter link which is adjustable transversely of the direction of movement of the aforesaid member whereby the oscillation of the tool carrier will cause said links to move the member.

3. In a tool grinding attachment for abrading devices, the combination of a member movable toward and away from the abrading surface, a rock shaft carried thereby, an arm rigid with said rock shaft, a supporting member carried by the arm, a tool support carried by the supporting member, a link rigid with the aforesaid rock shaft and extending therefrom in the direction of the aforesaid arm, a second link having one of its ends pivoted to the free end of the first mentioned link, and a pivotal support for the opposite end of the second link that is adjustable transversely of the direction of movement of the first mentioned member.

4. In a tool grinding attachment for abrading devices, the combination of a member having a guideway, a slide movable therewithin toward and away from the abrading surface, a rock shaft supported by said slide, a supporting member rigid with said rock shaft, a tool support carried by the supporting member, a link rigid with the aforesaid rock shaft, a second link that is pivoted to the free end of the former link, and a pivotal support for the opposite end of the latter link which is adjustable transversely of the direction of movement of the aforesaid slide.

5. In a tool grinding attachment for abrading devices, the combination of a stationary member having a guideway, a plate that is stationary with respect to said member and having a slot which is oblique to the longitudinal axis of the guideway, a slide movable within the guideway toward and away from the abrading surface, a tool supporting member pivoted to the slide, a pivot that is adjustable within the slot of the aforesaid plate, a link having one of its ends fulcrumed upon the pivot, and connections between the free end of the link and the aforesaid tool supporting member whereby the oscillation of said member will effect a movement of the slide.

6. In a tool grinding attachment for abrading devices, the combination of a member having a guideway, a plate that is stationary with respect to said member and is spaced therefrom and having a slot that is oblique with respect to the longitudinal axis of the guideway, a slide movable within the guideway toward and away from the abrading surface, a rock shaft supported by said slide, a link rigid therewith, a second link having one of its ends pivotally connected to the free end of the first link, a pivot adjustable along the aforesaid slot, the end of the second link remote from that attached to the first link being fulcrumed upon the pivot, and a tool supporting member angularly fixed with respect to the rock shaft.

7. In a tool grinding attachment for abrading devices, the combination of a member having a guideway, a plate that is stationary with respect to said member and is spaced therefrom and having a slot that is oblique with respect to the longitudinal axis of the guideway, a slide movable within the guideway toward and away from the abrading surface, a rock shaft supported by said slide, a link rigid therewith, a second link having one of its ends pivotally connected to the free end of the first link, a pivot adjustable along the aforesaid slot, means for locking the same in any adjusted position therealong, that end of the second link remote from the one attached to the first link being fulcrumed upon the pivot, an arm rigid with the aforesaid rock shaft on the side of the slide opposite the first mentioned link, a supporting member secured to said arm, and a tool support carried by the supporting member.

8. In a tool grinding attachment for abrading devices, the combination of a member having a guideway, a plate that is stationary with respect to said member and is spaced therefrom and having a slot that is oblique with respect to the longitudinal axis of the guideway, a slide movable within the guideway toward and away from the abrading surface, a rock shaft supported by said slide, a link rigid therewith, a second link having one of its ends pivotally connected to the free end of the first link, a pivot adjustable along the aforesaid slot, means for locking the same in any adjusted position therealong, the end of the second link remote from that attached to the first link being fulcrumed upon the pivot, an arm rigid with the aforesaid rock shaft on the side of the slide opposite the first mentioned link, a supporting member secured to said arm, a tool supporting device swiveled to the supporting member, and means for locking said device against movement with respect to the supporting member.

9. In a tool grinding attachment for abrading devices, the combination of a member having a guideway, a slide movable with-

in the guidway toward and away from the abrading surface, a supporting member pivoted to the slide, a turret rotatably supported by the supporting member, means for locking the same against movement with respect thereto, a tool support carried by the turret, and connections whereby the oscillation of the supporting member will cause reciprocation of the slide.

10. In mechanism of the character set forth, the combination of a supporting member having a substantially vertical bore, a turret having a stud that occupies said bore, means whereby the turret may be locked against movement with respect to the supporting member, the turret having a vertical guideway that is in substantial alinement with the axis of the aforesaid stud, an adjusting screw that is threaded upward through the stud and projects into the guideway, and a tool support slidable within the guideway and resting upon the end of the adjusting screw.

11. In mechanism of the character set forth, the combination of a supporting member having a substantially vertical bore, a turret having a stud that occupies said bore, the lower end of which is threaded, a nut for application thereto whereby the turret may be locked against movement with respect to the supporting member, the turret having a vertical guideway the central axis of which is substantially coincident with the axis of the aforesaid stud, an adjusting screw that is threaded upward through the stud and projects into the guideway, a tool support slidable within the guideway and resting upon the end of the adjusting screw, and means for attaching a gage finger to the turret on either side of its guideway.

12. In mechanism of the character set forth, the combination of a supporting member, a turret swiveled thereto and having a vertical guideway, a tool support slidable within the guideway, means for supporting the same at any elevation therein, and means for attaching a gage finger to the turret on each side of its guideway, said means comprising a sleeve having a key for coöperation with a keyway in the gage finger.

13. In mechanism of the character set forth, the combination of a supporting member, a turret swiveled thereto and having a vertical guideway, a tool support slidable within the guideway, a sleeve carried by the turret, a gage finger having a shank that is adapted to be received thereby, and means for preventing angular movement of the gage finger within the sleeve.

14. In mechanism of the character described, the combination of a tool supporting table, front and rear tool supports that are movable along said table, means for locking said supports to the table, the two supports having bores which are in axial alinement, a bushing that is adapted to be received by the bore of the front support, a bushing rotatable within the bore of the rear support, means for locking the latter bushing in various angular positions with respect to the support, and means for clamping the shank of a drill within said bushing.

15. In mechanism of the character described, the combination of a table having a longitudinal rail upon its upper surface, a front and a rear tool support movable along said rail, means for locking each tool support at any adjusted position along the rail, each of the supports having a bore which is in axial alinement with the bore of the other, a bushing for insertion in the bore of the front support, a bushing rotatable within the bore of the rear support and having a lateral flange which overhangs the end of the support adjacent its bore, said flange being provided with a series of apertures, a plunger movable longitudinally with respect to the support and arranged to be projected into any one of the aforesaid apertures, and means for clamping the shank of a drill within the bushing.

16. In mechanism of the character described, the combination of a tool supporting table, a front and a rear tool support movable therealong, each of the supports having a bore which is in axial alinement with the bore of the other, a bushing for insertion in the bore of the front support, a bushing rotatable within the bore of the rear support and having a lateral flange which overhangs the end of the support adjacent its bore, said flange being provided with a series of apertures, and a plunger movable longitudinally with respect to the support and arranged to be projected into any one of the aforesaid apertures.

17. In mechanism of the character described, the combination of a member having a guideway, a slide movable within the guideway toward and from the abrading device, a supporting member pivoted to said slide, a pivot adjustable transversely of the direction of movement of the slide, means for locking said pivot in a stationary position with respect to the member having the guideway, a link fulcrumed upon the pivot, connections between the aforesaid supporting member and the free end of the link whereby the oscillation of the former will rock the latter and thereby impart reciprocatory movement to the slide, a tool support carried by the supporting member, and means for attaching a tool to said tool support.

18. In mechanism of the character described, the combination of a member having a guideway, a slide movable within the guideway toward and from the abrading wheel, a supporting member pivoted to said guide, a pivot adjustable transversely of the

direction of movement of the slide, means for locking said pivot in a stationary position with respect to the member having the guideway, a link fulcrumed upon the pivot, connections between the aforesaid supporting member and the free end of the link whereby the oscillation of the former will rock the latter and thereby impart reciprocatory movement to the slide, a turret swiveled to the supporting member, said turret having a vertical guideway, a tool supporting table adjustable within the guideway, and means for attaching a tool to said table.

19. In mechanism of the character set forth, the combination of a supporting bracket having a head that is arranged to be clamped in a fixed position with respect to the abrading surface, a carrier supported by and movable with respect to the head obliquely toward and from the abrading surface, a slide reciprocable with respect to the head, means for operating said slide, adjustable connections between the slide and the aforesaid carrier, a member rotatably supported by the carrier and having a guideway and an abutment, an adjustable eccentric stop on the carrier that is adapted to be engaged by said abutment, a slide movable within the guideway, a supporting member pivoted thereto, a tool support carried by the supporting member, and means for locking the supporting member in various angular positions with respect to the last mentioned slide.

20. In mechanism of the character described, the combination of an arbor that is adapted to be supported in front of the abrading surface, a supporting bracket rotatably mounted thereon, means for locking said bracket in various angular positions with respect to the arbor, said bracket having a head, a channel within said head, a carrier having a block reciprocable within said channel, the channel and lock being of corresponding cross-sectional shapes and such as will prevent the lateral removal of the block, the carrier having a vertical bore, a slide reciprocable with respect to the head and in a direction parallel to the longitudinal axis of the channel, a screw that is threaded through a portion of said slide and through the block of the carrier, means for shifting the slide longitudinally, an eccentric stop pin supported by the carrier, a post revoluble within the bore of the carrier, a stop collar that is arranged to be locked to said post and having a shoulder for coöperation with the eccentric stop pin, means for oscillating the stop pin, a thrust collar for application to the post above the stop collar and adapted to bear thereon, the post having a head that is provided with a guideway, a plate spaced from one of the side faces of the head and rigidly attached thereto, the plate having a slot which is oblique to the longitudinal axis of the guideway, a pivot adjustable within said slot, means for locking the pivot in any adjusted position therealong, a slide within the guideway movable toward and from the abrading surface, a rock shaft journaled within said slide, an arm pinned to one end of said rock shaft, a link pinned to the opposite end thereof and projecting therefrom in substantially the same direction as the aforesaid arm, a second link that is pivoted to the free end of the first link and having its end opposite to such pivotal connection fulcrumed upon the aforesaid pivot, a supporting member attached to the free end of the arm, and projecting downwardly and laterally therefrom, a turret swiveled to the lower end of said supporting member, said turret having a vertical guideway, means for locking the turret to the supporting member in any angular position with respect thereto, a tool supporting table reciprocable within the guideway of the turret, means for supporting said table at various elevations within the guideway, means for attaching a tool to the supporting table, and means for locking the aforesaid arm to the last mentioned slide in various adjusted positions.

In testimony whereof, I hereunto affix my signature in the presence of two witnesses.

BONNIE L. MALLORY.

Witnesses:
BRENNAN B. WEST,
HUGH B. MCGILL.