March 10, 1942. C. H. BERG 2,275,496

DRILL-GRINDING FIXTURE

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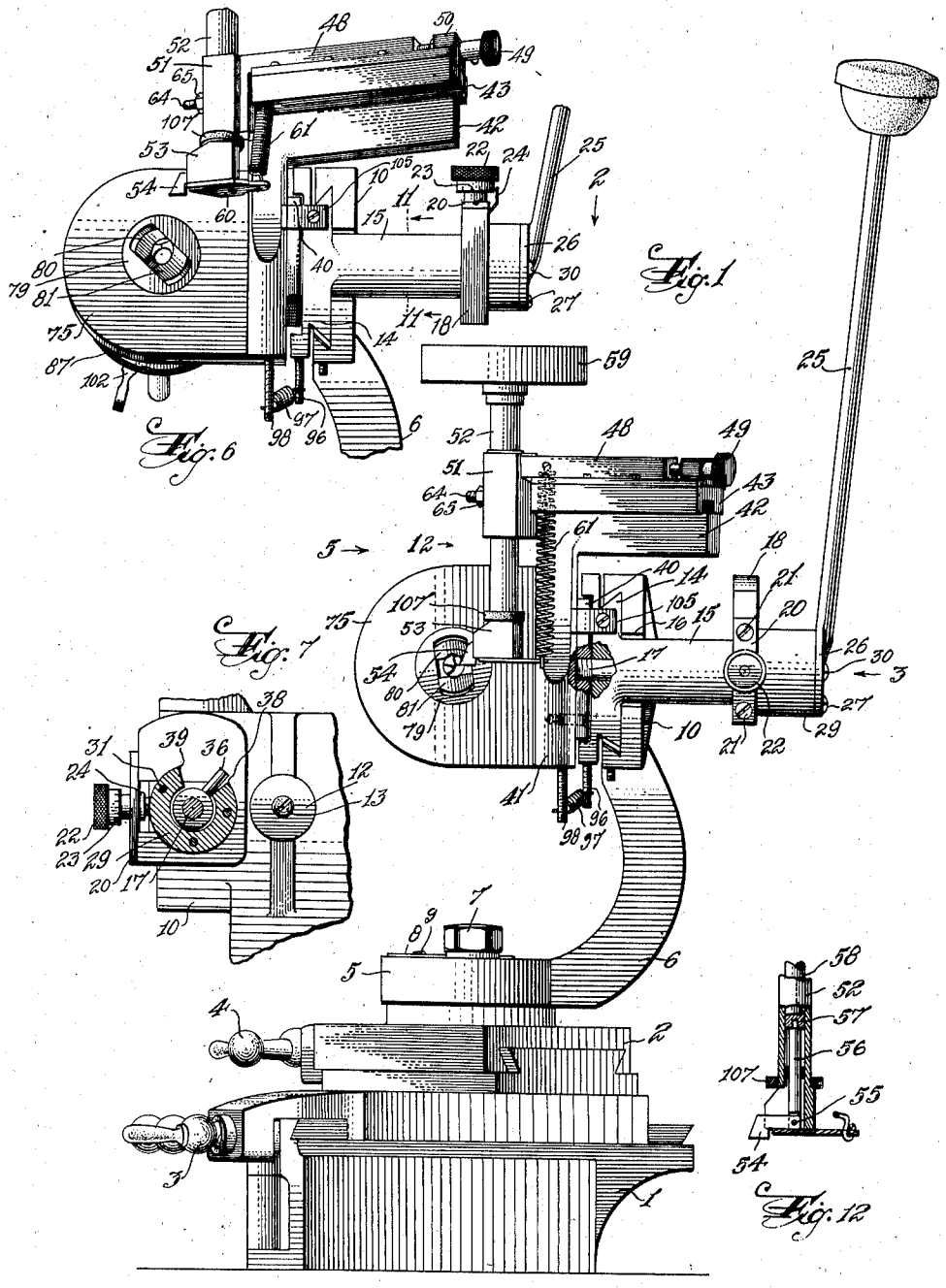


Fig. 1

Fig. 6

Fig. 7

Fig. 12

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Fig. 14

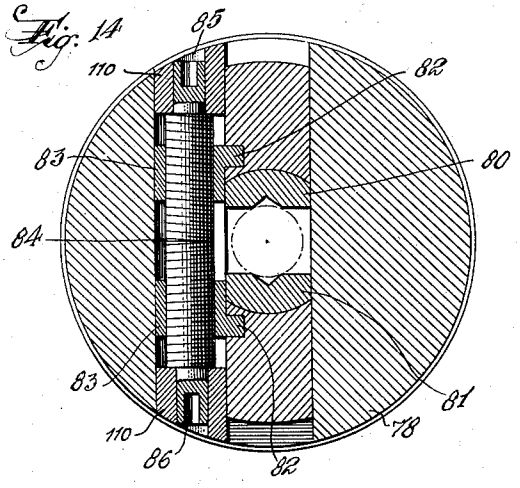


Fig. 2

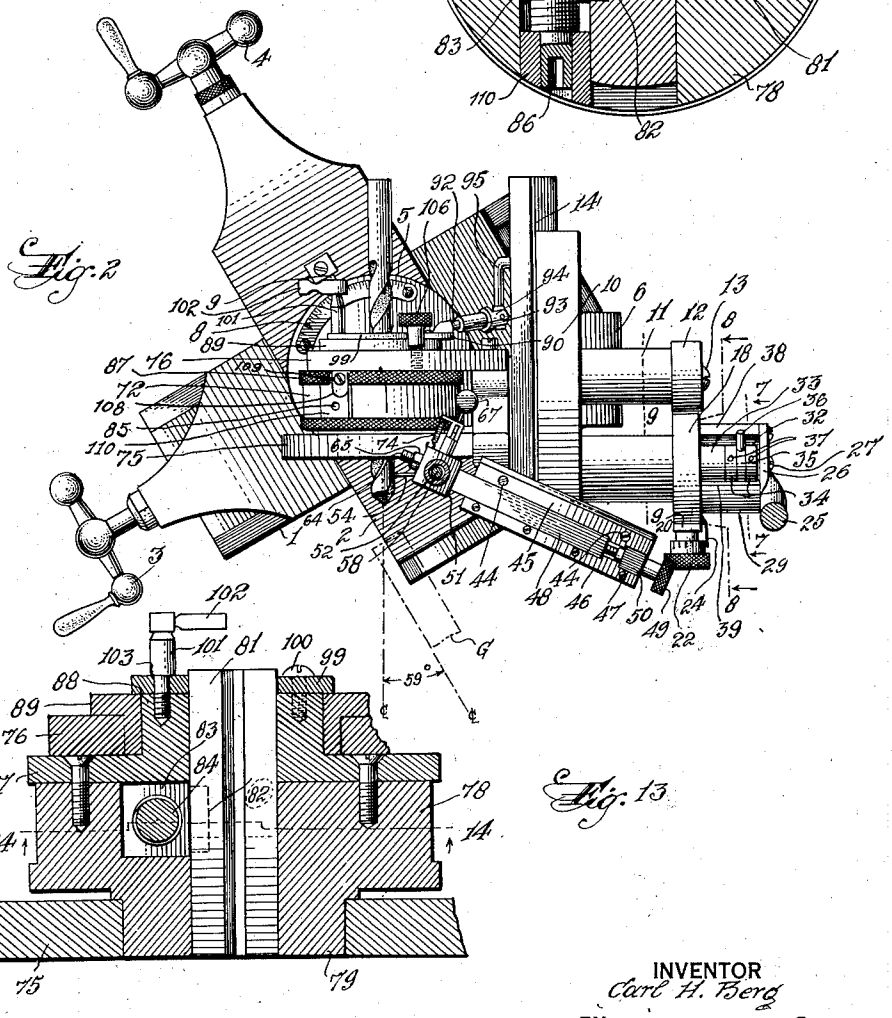


Fig. 13

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DRILL-GRINDING FIXTURE

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Fig. 3

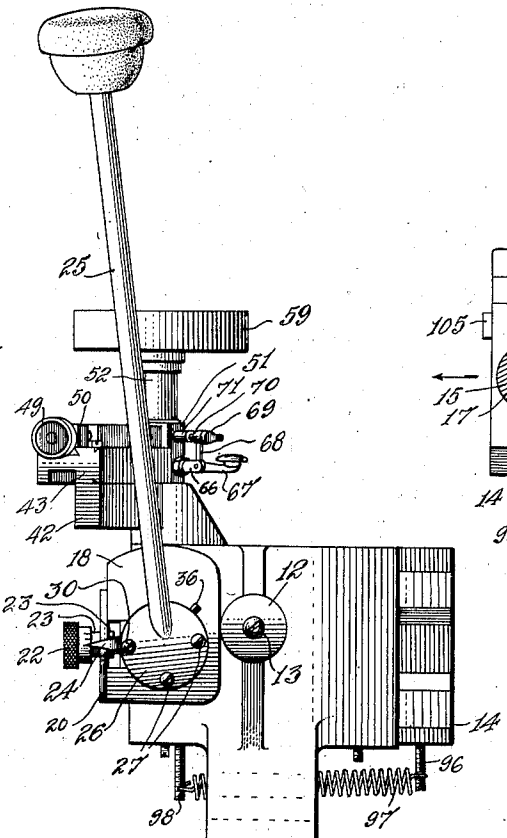


Fig. 10

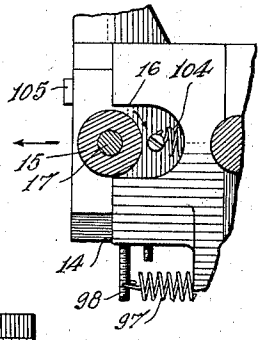


Fig. 9

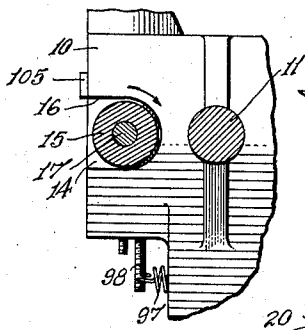


Fig. 8.

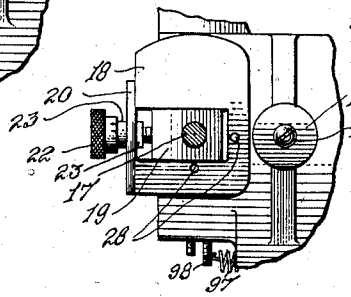
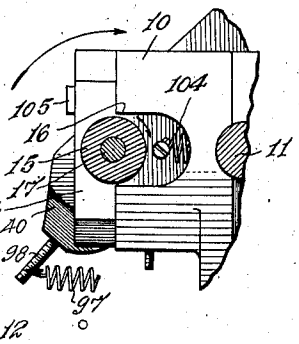


Fig. 11



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Fig. 4

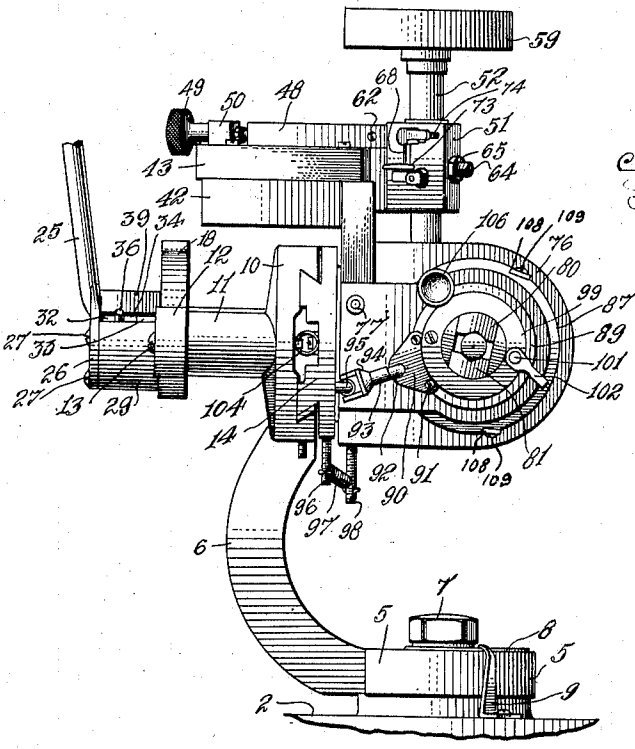
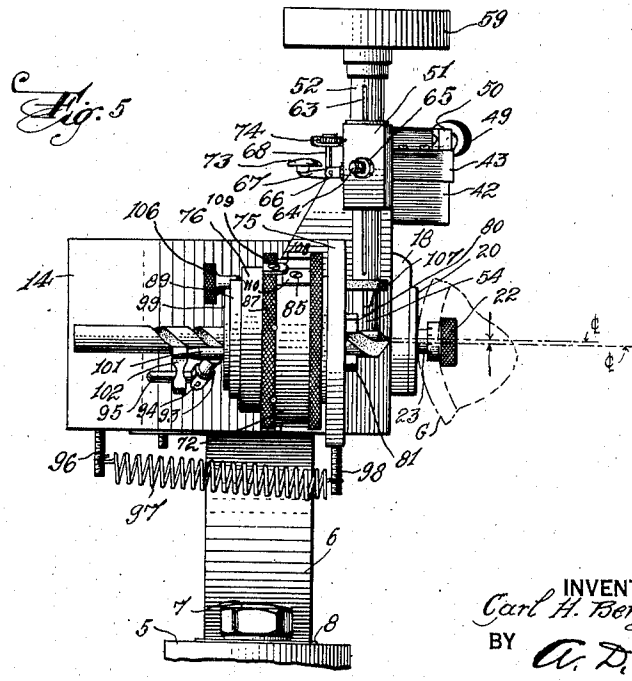


Fig. 5



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UNITED STATES PATENT OFFICE

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DRILL-GRINDING FIXTURE

Carl H. Berg, Bloomfield, N. J.

Application September 27, 1940, Serial No. 358,579

21 Claims. (Cl. 51—219)

This invention relates to a form of fixture for grinding drills.

It is one of the objects of my invention to provide a fixture for grinding drills so as to get complete uniformity on the lips of the drill, for all different sizes within the range of the fixture, so that the bearing point of the drill will be at the axis of the drill, whereby the drill will make a true and uniform hole.

Another object of my invention is to provide a drill grinding fixture which can be quickly set or adjusted so that drills may be ground to any desired clearance, depending on the material on which the drills are to operate.

Another object of my invention is to provide a drill grinding fixture which can be set to grind twist drills and end mills either of the two or four-lip type, and to get onto all of these drills a better and stronger cutting edge.

Another object of my invention is to provide a drill grinding fixture which can be quickly set or adjusted to get a greater range of cutting angle on the drill than can be obtained with any other drill grinding fixture of which I am aware.

These and other objects and advantages will be readily understood and appreciated by those skilled in this particular art, by reference to the following specification taken in connection with the annexed drawings, wherein:

Figure 1 is a side elevation of the machine.

Figure 2 is a top view of Figure 1, with some of the parts removed.

Figure 3 is a view of the upper part of Figure 1, looking from right to left.

Figure 4 is a view of the upper part of the machine, looking from the back side of Figure 1.

Figure 5 is a view of the upper part of Figure 1, looking from left to right.

Figure 6 is a view of the upper part of Figure 1, with certain of the parts turned to another position.

Figure 7 is a view on the line 7—7 of Figure 2.

Figure 8 is a view on the line 8—8 of Figure 2.

Figure 9 is a view on the line 9—9 of Figure 2.

Figure 10 is a view similar to Figure 9, but with the parts in a different position of operation.

Figure 11 is a view on the line 11—11 of Figure 6.

Figure 12 is a view on the line 12—12 of Figure 1.

Figure 13 is a sectional view through the drill chuck.

Figure 14 is a view on the line 14—14 of Figure 13.

In the various views, wherein like numbers refer to corresponding parts, 1 and 2 are a pair of relatively adjustable base slides, the numbers referring to the complete slides which are similar to those found on various types of machines. These slides are set at right angles to each other and each has its adjusting screw handle 3 and 4, respectively.

The bottom of the slide 1 is adapted to be mounted on the bed plate of a drill grinding wheel, and by reason of the slides the drill grinding fixture may be moved to the proper position with respect to the grinding wheel. The slide 2 supports the base portion 5 of an arm 6, the portion 5 being held to the slide 2 by a screw stud 7. The portion 5 is provided with a scale 8 which cooperates with a finger 9 fastened to the slide 2. These parts are so associated that the arm 6 can be set to the desired angle, such as illustrated in Figure 2.

The upper end of the arm 6 has a support member 10 from which projects a stud 11 carrying a roller 12 fastened thereto in any satisfactory manner as by screw 13. The member 10 is provided with slideways to receive a plate 14 which is slidably mounted in the dovetail guideway. The plate 14 has a projecting hub 15 which, in the normal idle position of the fixture, is positioned in a notch or cutout portion 16 in the support member 10.

The hub 15 supports a shaft 17 which extends therethrough. Rotatably mounted on the shaft 17, is a cam member 18. This mounting comprises a slide 19 through which the shaft 17 passes. A bar 20 is fastened to the edge of the cam 18 as by screws 21. The bar 20 carries an adjusting screw 22 which is threaded into the slide 19 and has collars 23 on opposite sides of the bar 20, so that when the adjusting screw 22 is turned, the cam 18 is moved laterally with respect to the shaft 17, thereby changing the time at which various portions of the cam 18 will contact with the roller 12 for the purposes which will be hereinafter described. A part of the adjusting screw 22 is provided with scale divisions which cooperate with an indicator finger 24 carried by the slide 19 to indicate the setting of the cam 18.

An operating lever 25, terminating in a plate portion 26, is fastened to the cam 18 by means of screws 27 which enter the screw-holes 28 in the cam. The screws pass through a spacing collar or sleeve 29 against the end of which the portion 26 of the lever bears. Another screw 30 assists in holding the plate 26 to the spacing collar, which is provided with a hole 31 to receive the screw 30.

The spacing collar or sleeve 29 has an arcuate segment cut out, leaving an opening 32 therein, as more clearly seen in Figure 2. Located within the sleeve and observed through the opening 32, is what I term a pickup means which is fastened to the end of the shaft 17. This pickup means includes a spacing collar 33 located on the shaft, and a pair of lock nuts 34 which act to grip a ring 35 carrying a projecting pin 36. The lock nuts 34 are provided with holes 37 to receive a spanner wrench so that they may be set up tightly against the ring 35 to securely lock it to the shaft 17. The pin 36 projects through the opening 32 in the spacing sleeve and when the apparatus is in idle position, the pin 36 will contact with the edge 38 of the opening in the spacing sleeve 29, but when the operating lever 25 is moved a sufficient amount, as will be later described, the pin 36 will engage the opposite edge 39 of the opening in the sleeve 29 for a purpose to be later referred to.

The inner end of the shaft 17, or that end opposite the handle 25, is threaded into a plate 40 which is fastened to or which may be an integral part of a bracket 41. The bracket 41 has an angularly projecting arm 42 which carries a block 43 fastened thereto by a plurality of screws 44, which also act to hold a guide strip 45 in position. A complementary guide strip 46 is fastened to the opposite side of the block 43 by a plurality of screws 47. Between these guide strips, is located a bar 48 which is adjustable longitudinally of the block 43 by means of a screw 49 carried by a stud 50 which is fastened to the block 43. On the opposite end of the bar 48, from the adjusting screw 49, is mounted a support member 51 which carries a plunger 52 on the lower end of which is mounted a holder 53. The holder 53 is slotted, and in this slot is positioned a gauge finger 54 formed as shown in the different views, and having its inner end attached as by pins 55 to a rod 56 which has a slidable, detachable engagement 57 with a stem 58 of a gauge 59, the stem of which projects within the plunger 52.

The holder 53 has fastened thereto an arm 60, to the end of which is attached a spring 61, the opposite end of which is attached to a screw 62 in the bar 48. The plunger 52 is provided with a guide groove 63 which cooperates with the end of a screw 64 locked in position by a nut 65 in the support member 51. This screw 64 prevents the plunger 52 from turning in its support member 51. The support member 51 carries a stud 66 which pivotally supports a bellcrank lever 67, the arm 68 of which is slidably positioned in the head 69 of a pin 70 slidably carried in a stud 71 fastened to the support member 51. The inner end of the pin 70 engages a hole or recess in the wall of the plunger 52 so as to hold the plunger and indicator down when it is moved to the gauging position, as indicated in Figure 1.

After the drill has been set in the drill chuck 72, so that the gauge finger or clip 54 engages the lip of the drill where the flute runs down to the point, then the gauge is returned to its uppermost position by pressing on the button portion 73 of the bellcrank lever 67, it being understood that a spring 74 acts on the head 69 of the pin 70 to continually urge the pin toward the plunger 52, so that as the gauge or indicator 59 is moved down to the indicating position, as previously described, it will be automatically locked in this position; and when it is released by the button 73, as described, the spring 61 will return the plunger 52 and gauge 59 to idle position, it being understood that the transverse adjustment of the gauge and other parts for different diameters of drills is made by the adjusting screw 49. If desired, a buffer washer 107 may be used to relieve the shock on the gauge when being returned to idle position.

The drill chuck 72 is positioned by and between a plate 75 extending from and preferably integral with the bracket 41, and a plate 76 fastened to the bracket by screws, one of which, 77, is shown in Figure 4. The drill chuck has a main body portion 78 with a hub 79 supported in the plate 75. The body portion 78 carries the drill jaws 80 and 81 which are T-shaped, and each provided with a groove to receive a projection 82 on the nuts 83 which are engaged by right and lefthand threads on a screw 84, which is accessible through either of the orifices 85 or 86. The drill jaws and set screw are held in place on the member 78 by a cover plate 87 which has a hub portion 88 positioned within the support plate 76 which also carries a ring 89 which may be shouldered as indicated in Figure 13. The ring 89 has an arcuately formed member 90 fastened thereto as by screws 91.

The member 90 has a projection 92 which enters the sleeve 93 of a joint member 94, which is of the Universal type, the other member 95 of which is fastened to the slide plate 14 which is provided with a stud 96, to which is attached one end of a spring 97, the opposite end of which is fastened to a stud 98 fastened to the bracket 41.

Attached to the hub 88 of the cover plate 87, is a disc 99 which slightly overlaps the ring 89. The attachment of the disc 99 to the hub 88 is made by a screw 100 and a stud 101 having an operating lever 102. The screw 100 is only used to position the disc 99 in arcuate position and is not screwed up tightly, whereas the stud 101 is provided with a shoulder 103 so that when the stud 101 is turned up tightly, the disc 99 will clamp the chuck to the ring member 89, and when the shaft 17, carrying the bracket 41, is turned, the chuck and drill will be turned or given an oscillatory motion through the medium of the Universal joint connection just previously described.

From what has been said as to the operation of the various parts, the general operation may be briefly stated as follows: When the operating lever 25 is first moved away from the operator, looking at Figure 1, the cam 18 engages the roller 12, and this moves the slide plate 14, carrying the hub 15 and associated parts together with the bracket 41 and chuck and drill and other parts, forward toward the grinding wheels shown in dotted lines G in Figure 2. As soon as the approaching edge 39 of the sleeve 29 engages the pin 36, the shaft 17 and the bracket 41 will begin to turn and move to the position shown in Figure 6.

If the stud 101 is set up to lock the disc 99, as described, then the entire chuck 72 will turn so as to arcuately move the end of the drill to get the necessary curved surface forming the cutting angle of the drill. On completion of this movement, the pressure is released from the handle 25 and the spring 97 will return the bracket and chuck back to their normal position, against a stop member 105 fastened to the slide plate 14; and a spring 104, positioned within a recess in the support member 10 and having one end fastened thereto while the other end is fastened to the slide

plate 14, will return the slide plate 14 and its associated parts to normal position.

When it is desired to grind end mills or other tools which do not require the rotation of the chuck heretofore described, the stud 101 is released so that the disc 99 is free from clamping engagement with the ring 89 and a set screw 106 passes through the support plate 76 into engagement with the chuck plate 87, thereby locking the chuck to its support plates and the bracket 41.

Another important feature of my invention resides in the chuck portion thereof. During the continued use of the drill chuck, the parts, particularly the screw 84, may become worn sufficiently so that the initial setting of the screw 84 and associated parts may shift enough, when tightening a drill in the chuck, that the axial center of the drill is not in its true center, which means that the drill, when ground under these conditions will drill an eccentric hole. This eccentricity is disclosed by the gauge 59 at the time of setting the drill, as heretofore explained. For example, when the gauge finger 54 is brought into setting engagement with the drill, the gauge should read the same when the chuck is rotated to bring the other flute or flutes into the same gauging position, as the first flute.

Another way of checking the position of the chuck jaws and other parts is to use a round rod which has been checked and held as a gauging member. If the chuck members are in proper position, there will be no change in the gauge readings, as the chuck is turned to move the gauge rod against the end of the gauge finger 54. If any variation is found, then the chuck jaws 80 and 81 may be shifted laterally in the chuck by means of clips 108 fastened to the cover 87 as by a screw 109, it being understood that there is a corresponding clip 108 on the opposite side of the chuck. The clips 108 engage rectangular-shaped blocks 110 in which the ends of the screw 84 are located. By loosening the clip 108 on the side of the chuck, and readjusting the screw 84 through, for example, the hole 85, the chuck jaws will be shifted with respect to the axial center of the chuck. When the proper position is found, the clip 108 is tightened into position to grip its associated block 110. If the eccentricity is in the opposite direction, then the opposite adjustment will be made.

From the construction herein disclosed, it will be seen that I have obtained a drill grinding fixture which can be set so as to get a change in the cutting angle of from approximately four to fifteen degrees, whereas ordinary drill grinders only have a range of from about twelve to fifteen degrees. I can also get a clearance angle of from thirty to ninety degrees, which is much greater than on any of the drill grinders of which I am aware. These, together with the other advantages which are obtained, result from the construction described, certain details of which may be varied without departing from the spirit of my invention or the scope of the appended claims.

I claim:

1. In a drill-grinding fixture, a pair of relatively adjustable base slides mounted, one above the other, an arm rotatably carried on the upper of said slides, a support member on the arm, a plate slidably mounted on said support, a hub projecting from said plate, a shaft supported by the hub and extending therethrough, a cam rotatably mounted on one end of the shaft adjacent said hub, an operating lever mounted to turn the cam, a roller carried by the support member and adapted to be engaged by the cam when turned by said lever to move said plate, hub, shaft, cam and lever bodily forward, a bracket carried on the end of said shaft opposite to said lever and rotatable therewith, a drill chuck to take a drill carried by said bracket, and pickup means fastened to the shaft and disposed between the cam and lever mounting for turning the shaft, bracket, chuck and drill after a predetermined movement of the cam.

2. A drill-grinding fixture as set forth in claim 1, further defined in that means are provided for adjusting the cam transversely of the shaft for the purpose described.

3. A drill-grinding fixture as set forth in claim 1, further defined in that said pickup means comprises a sleeve interposed between the lever and cam, the sleeve having an arcuate segment cut away and a ring fastened to the shaft and having a pin projecting through the opening made by the cut-out sleeve segment, the pin being engaged by a wall of the sleeve as this is moved by the lever succeeding the sliding movement of the plate.

4. A drill-grinding fixture as set forth in claim 1, further defined in that said bracket has a projecting arm, an adjustable member supported by the arm, a plunger slidably carried by a part of said adjustable member, a gauge carried by the plunger and having an operating stem extending downwardly within the plunger, a holder on the lower end of the plunger, a drill-setting finger carried by the holder and operatively connected to the gauge stem within the plunger, means for arcuately positioning the plunger, means for holding the plunger and parts carried thereby in drill-setting position after having been moved thereto, and means for releasing the holding means and returning the plunger with its parts to normal position.

5. A drill-grinding fixture as set forth in claim 1, further defined in that said bracket carries a gauge and a drill-setting finger operatively connected to the gauge, with means for adjusting the location of the setting finger with respect to a drill carried by the chuck.

6. A drill-grinding fixture as set forth in claim 1, further defined in that said bracket carries a gauge and a drill-setting finger operatively connected to the gauge, with means for adjusting the location of the setting finger with respect to a drill carried by the chuck, with further means for holding the drill-setting finger in a setting position when it is moved thereto.

7. A drill-grinding fixture as set forth in claim 1, further defined in that said bracket carries a gauge and a drill-setting finger operatively connected to the gauge, with means for adjusting the location of the setting finger with respect to a drill carried by the chuck, with further means for holding the drill-setting finger in a setting position when it is moved thereto, and still further means for returning the setting finger together with the gauge to non-setting position.

8. A drill-grinding fixture as set forth in claim 1, further defined in that said bracket has a pair of laterally spaced parallel plates, at least one of which is detachable, said chuck being supported between said plates.

9. A drill-grinding fixture as set forth in claim 1, further defined in that said bracket has a pair of laterally spaced parallel plates, at least one of which is detachable, said chuck being rotatably supported between said plates, and means for imparting a rotary motion to the chuck when the

said shaft is given a rotary motion as described.

10. A drill-grinding fixture as set forth in claim 1, further defined in that said bracket has a pair of laterally spaced parallel plates, at least one of which is detachable, said chuck being rotatably supported between said plates, a ring positioned around one end of the chuck, a connection including a type of Universal joint between the ring and said slidable plate, and means for clamping the ring to the chuck when it is desired to have the chuck turn at the same time with the bracket for usual drill grinding.

11. A drill-grinding fixture as set forth in claim 1, further defined in that said bracket has a pair of laterally spaced parallel plates, at least one of which is detachable, said chuck being supported between said plates, and means for locking the chuck to one of said support plates when it is desired to grind certain types of drills.

12. In a drill-grinding fixture, base support means for the fixture, an arm adjustably carried by a part of said base support means, a support member carried by the arm, a plate slidably mounted on said support, a shaft supported by the plate, a bracket attached to one end of the shaft, a cam rotatably mounted on the other end of the shaft, operating means connected to the cam, means positioned to be engaged by said cam to force it and the shaft, plate and bracket laterally according to the contour of the cam, a drill chuck carried by said bracket, and pickup means fastened to the shaft and disposed between the cam and said operating means for turning the shaft and parts fastened thereto after a predetermined movement of the cam.

13. A drill-grinding fixture as set forth in claim 12, further defined in that the cam is carried on a transverse block through which said shaft passes, the cam and block having cooperative means for adjusting the cam laterally on the block.

14. A drill-grinding fixture as set forth in claim 12, further defined in that the operating means for the cam includes a sleeve fastened to the cam and a lever fastened to the sleeve, the sleeve having an opening in its wall, the sides of the opening acting to engage a pin operatively connected to the shaft and serving with the sleeve as said pickup means.

15. A drill-grinding fixture as set forth in claim 12, further defined in that said bracket has an arm and a gauge support and adjusting mechanism including a finger mounted so as to be moved to engage a drill carried by the chuck at the proper place to properly position the drill when placed in the chuck.

16. A drill-grinding fixture as set forth in claim 12, further defined in that said bracket has an arm and a gauge support and adjusting mechanism including a plunger mounted for vertical movement and carrying a gauge on the upper end and a setting finger at the lower end, the said finger being operatively connected to the operating stem of the gauge, as and for the purpose described.

17. A drill-grinding fixture as set forth in claim 12, further defined in that said bracket has an arm and a gauge support and adjusting mechanism including a plunger non-rotatable but slidable vertically and carrying a gauge at one end and a setting finger at the other end, and means for holding the plunger in a depressed position when so moved to bring the finger into setting engagement with a drill in the chuck, and means for releasing and returning the plunger to non-drill setting position.

18. A drill-grinding fixture as set forth in claim 12, further defined in that the chuck is carried by the bracket so it may be given a rotary motion, and means for imparting to the chuck a rotary motion simultaneous with rotation of the bracket, and further means for holding the chuck from turning when it is desired to grind certain tools as described.

19. A drill-grinding fixture as set forth in claim 12, further defined in that the bracket has a pair of spaced parallel plates extending therefrom, while the chuck has oppositely disposed hubs extending in the plates for rotation therein, and means including a compensating type of connection between the chuck and the slidable plate to give the chuck a rotary motion when the slidable plate is moved to its full drill-grinding position coincident with the turning of the bracket.

20. For use in a drill-grinding fixture as herein described, a chuck having a single-piece main body portion having in one face a transverse channel therein displaced from the axis of the chuck and carrying oppositely threaded nuts in spaced relation in said channel, each nut having a projection thereon and a screw with right and lefthand threads to fit said nuts and T-shaped drill jaws each jaw having a groove in the bearing stem of the T to receive the projection on its cooperative nut, a single cover to hold the nut and jaws in position in the body portion, both the body and cover having hub portions for rotatably mounting the chuck in a fixture part, a one-piece, continuous ring fitting one end of the chuck and having means for rotating the ring, and means overlapping the edge of the ring for locking the ring to the chuck for the purpose described.

21. In a chuck as set forth in claim 20, further defined in that means are provided on the chuck for adjusting the screw and nuts carried thereby longitudinally of the channel, thereby moving the chuck jaws accordingly to compensate for wear on these parts, whereby the members to be held in the chuck for grinding are truly centered in the chuck.

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