Jan. 3, 1939. R. P. STOCKING 2,142,923

DRILL GRINDING MACHINE

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Fig. 1.

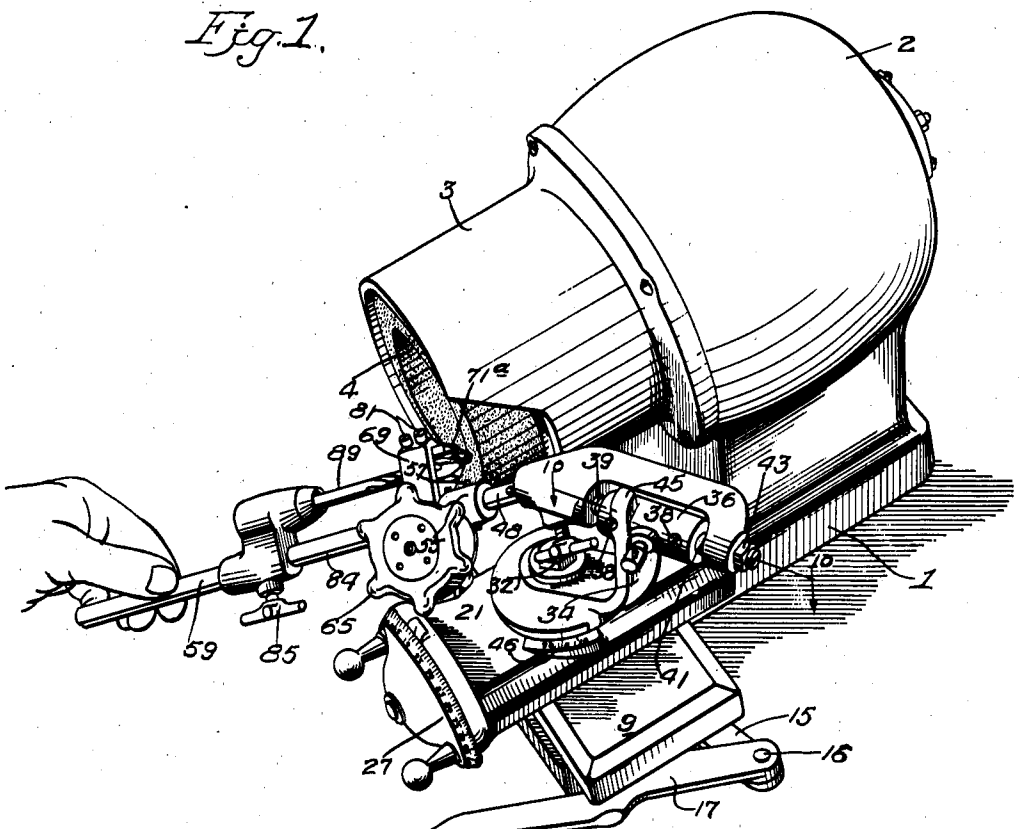
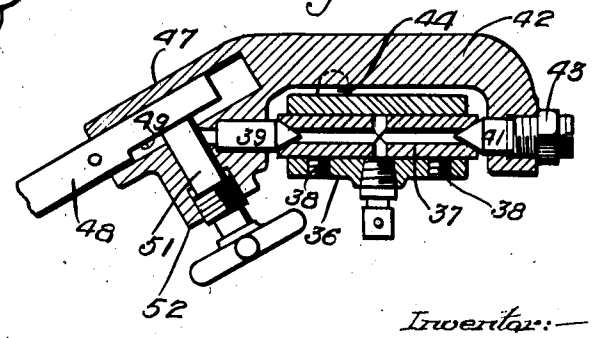


Fig. 10.



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Fig. 2.

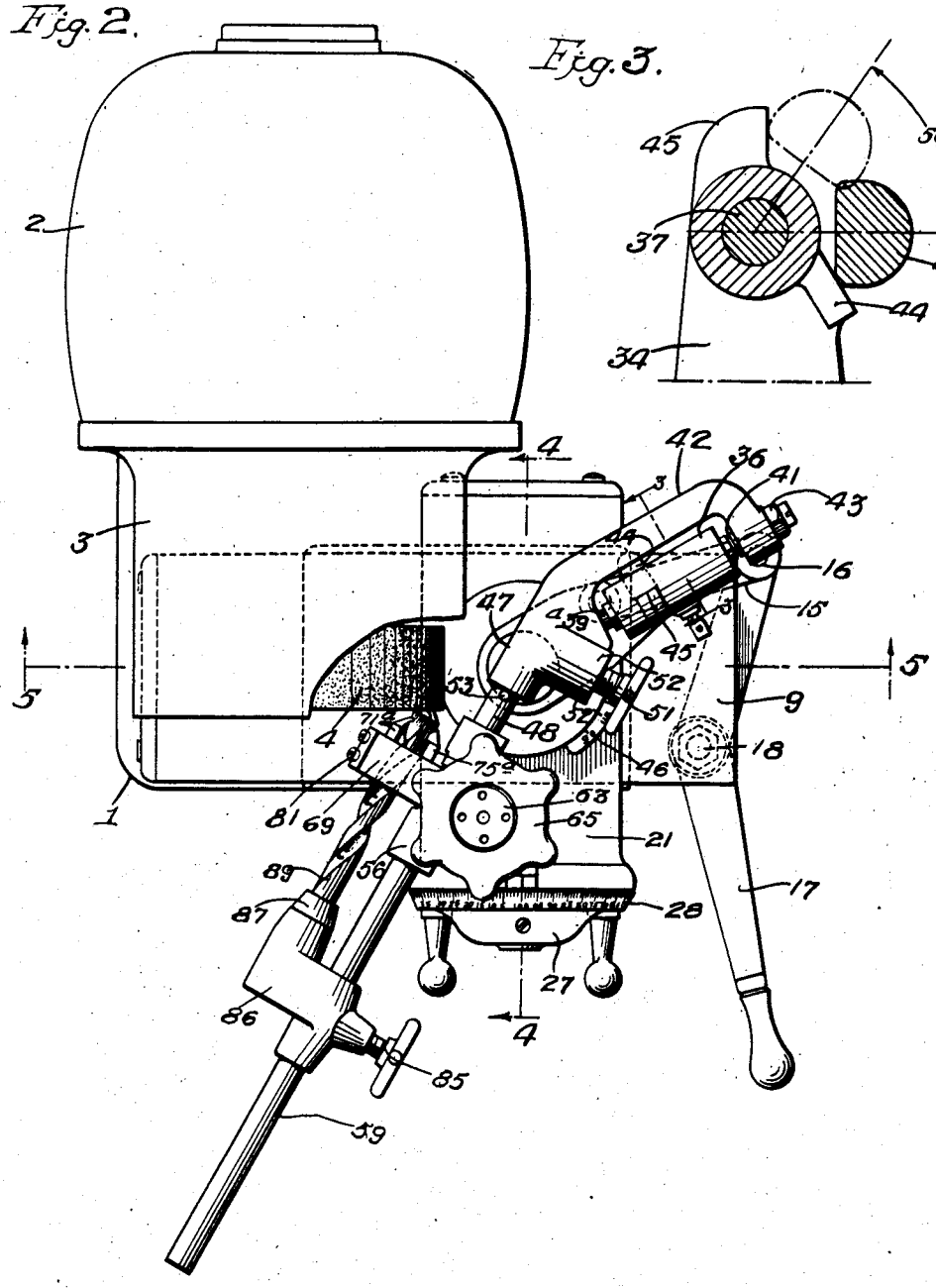


Fig. 3.

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DRILL GRINDING MACHINE

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Fig. 4.

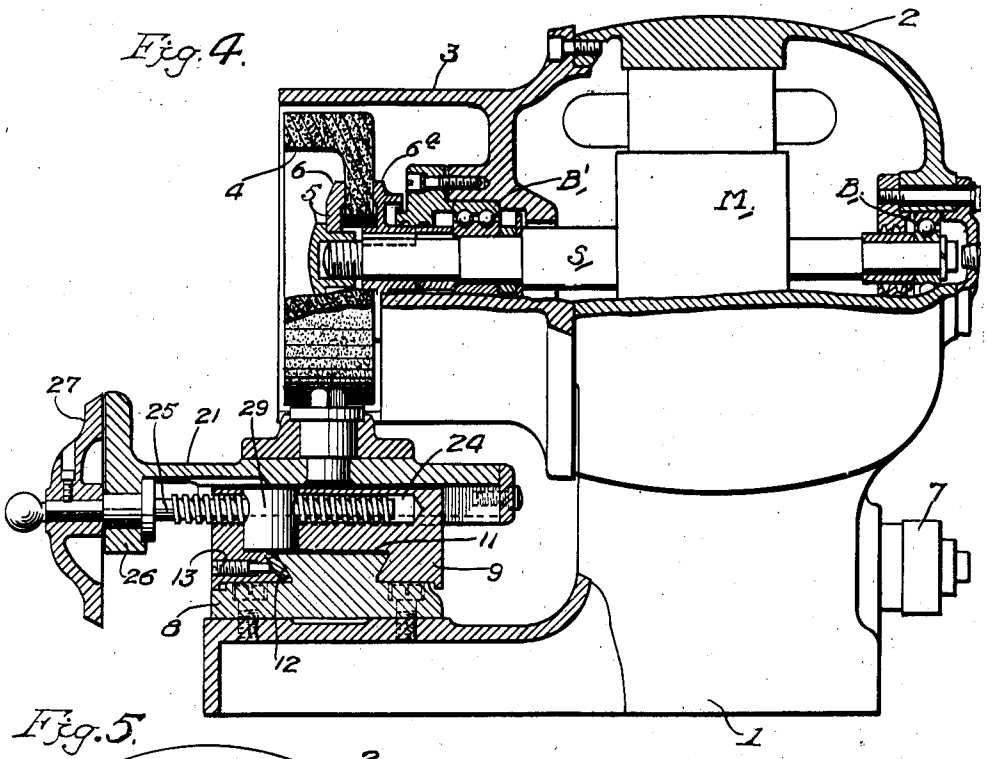
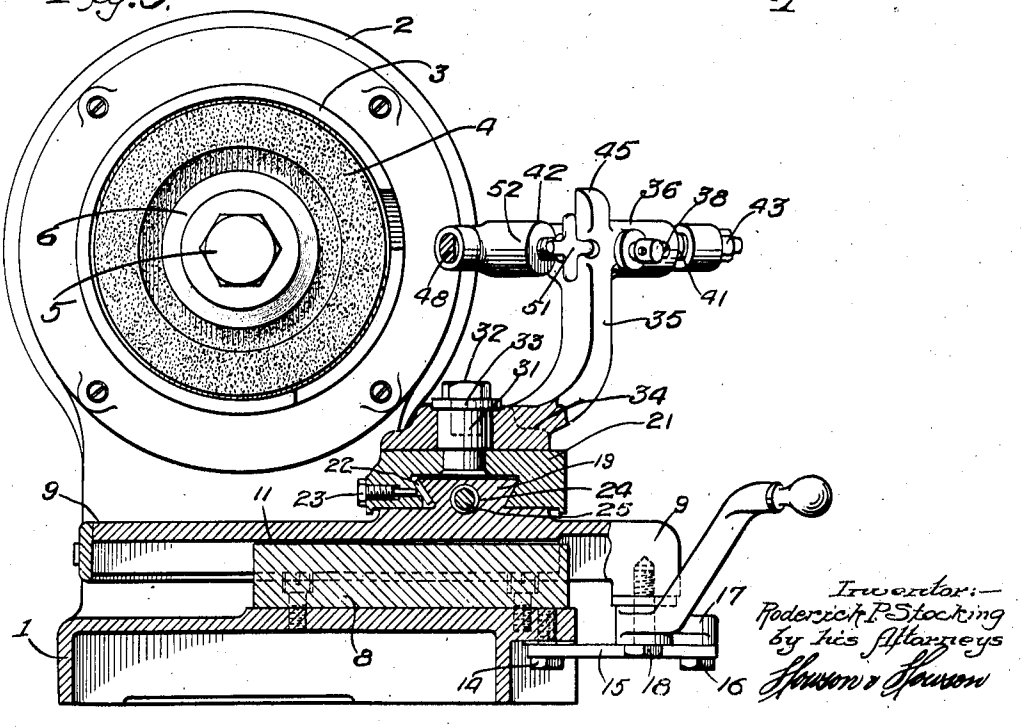


Fig. 5.



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Fig. 6.

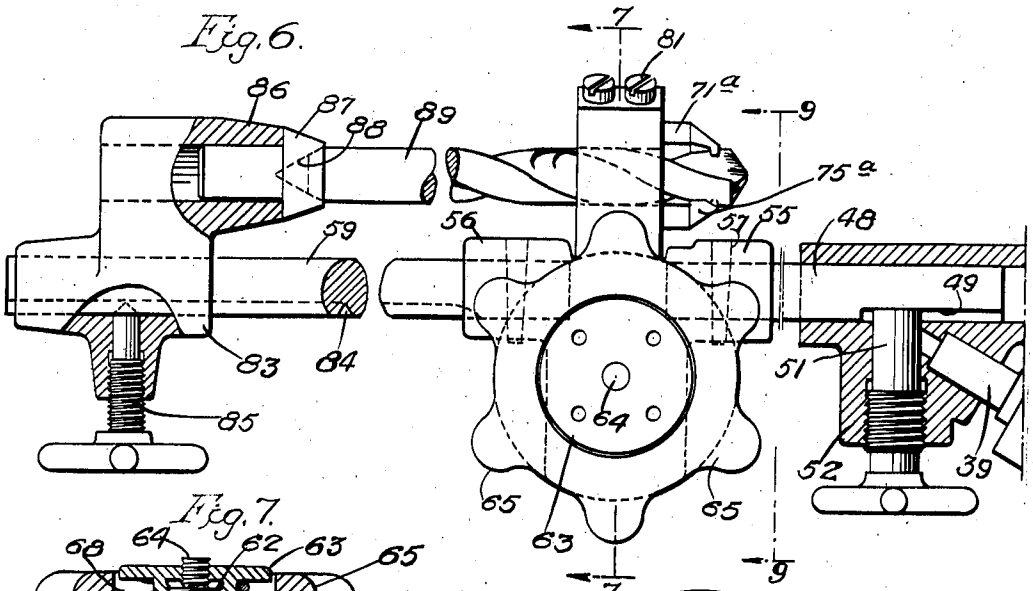


Fig. 7.

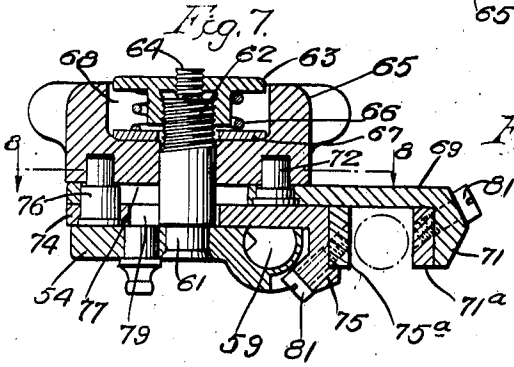


Fig. 8.

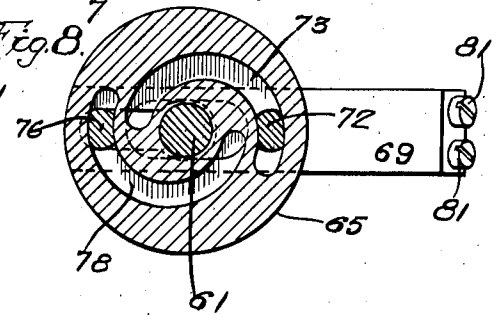
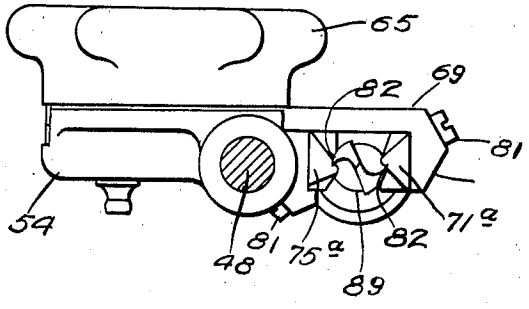


Fig. 9.



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Patented Jan. 3, 1939 2,142,923

UNITED STATES PATENT OFFICE

2,142,923

DRILL GRINDING MACHINE

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Application August 5, 1936, Serial No. 94,453

3 Claims. (Cl. 51—219)

A principal object of this invention is to provide a drill grinding machine in the form of a self-contained unit capable of producing a precise scientifically designed point upon drills of the smaller sizes, said machine being adapted not only for regrinding dull drills, but also for efficiently and economically reclaiming badly burned or broken drills of the smaller sizes which heretofore have been discarded because of the tediousness and expensiveness of reclaiming.

To this general end, another object of the invention is to provide a grinding machine of the stated character that shall be capable not only of the finish grinds required for the normal resharpening operation, but also of the rapid hogging cuts required for efficient and economical restoration of broken drills.

Still another object of the invention is to provide a machine that will maintain its initial accuracy of operation over an extended period of time, regardless of uneven wear of the parts, and which shall also afford a maximum grinding wheel life with a minimum requirement for wheel dressing.

A still further object of the invention is to provide a novel and highly efficient drill-holding chuck and one that may be rapidly and conveniently manipulated.

The invention further resides in the novel structural and mechanical features hereinafter described and illustrated in the attached drawings, wherein:

Figure 1 is a view in perspective of a machine made in accordance with my invention;

Fig. 2 is a plan view of the machine;

Fig. 3 is a section on the line 3—3, Fig. 2;

Fig. 4 is a section on the line 4—4, Fig. 2;

Fig. 5 is a section on the line 5—5, Fig. 2;

Fig. 6 is a fragmentary plan view and partial section showing the details of the drill chuck;

Fig. 7 is a section on the line 7—7, Fig. 6;

Fig. 8 is a section on the line 8—8, Fig. 7;

Fig. 9 is a sectional view on the line 9—9, Fig. 6, and

Fig. 10 is a section on the line 10—10, Fig. 1.

With reference to the drawings, the machine in a preferred embodiment comprises a base member 1 which includes an integral housing 2 for an electric motor M. The shaft S of said motor extends forwardly from the housing 2 and into a tubular housing extension 3, which is suitably secured to the forward side of the housing 2, and carries at its forward end a grinding wheel 4, this wheel in the present instance being of the cup type, as shown in Figs. 4 and 5, and being secured to the shaft by means in the present instance of a nut 5 and washers 6 and 6a, the latter washer being keyed to the shaft S as shown. The wheel 4, as shown in Fig. 4, lies in the forward end of the housing extension 3, the latter thereby constituting a guard for the wheel. The shaft S is journaled in bearings B, B', supported respectively in the back of the housing 2 and in the extension 3, the bearing B' being preferably of the preloaded type, and provision is made, as illustrated, for imposing the axial thrust of the shaft upon the bearings to avoid end play. Suitable means illustrated at 7 in Fig. 4 is provided at the back of the base 1 for connecting the motor with a suitable source of electric energy.

Secured at the forward end of the base 1 and extending transversely of the latter is a dovetailed guide member 8 upon which is fitted a slide or carriage 9 by means of which, as hereinafter described, the drill which is to be sharpened or reground is traversed across the face of the grinding wheel. The under side of the carriage 9 is provided with a dovetailed recess 11 which receives the dovetailed guide of the member 8, see Fig. 4. A gib 12 is provided at the front side of the recess 11, this gib being locked in position by means of a set screw 13 threaded into the carriage 9.

Pivotally secured to the under side of the base 1 by means of a screw 14 is a link 15, to the outer end of which is pivotally secured, at 16, one end of a lever 17 which projects toward the front of the machine and beyond the base and which is pivotally secured intermediate its ends by means of a screw 18 to one end and at the under side of the carriage 9. The arrangement is such that by oscillation of the lever 17 in the horizontal plane and about the floating pivot 16 the carriage 9 may be reciprocated transversely of the axis of the grinding wheel 4.

At the top of the carriage 9 is a dovetailed guide 19, to which is slidably fitted a sub-carriage or slide 21 for movement longitudinally of the machine and parallel to the axis of the grinding wheel. A gib 22 is provided at one side of the dovetail and is held in place by a screw 23. The dovetail guide 19 of the carriage 9 is provided with a longitudinal cylindrical bore 24 which, as shown in Fig. 4, extends inwardly from the forward side of the carriage 9, and this bore is adapted for reception of a micrometer screw 25 which is rotatably mounted in a depending flange 26 at the forward end of the carriage 21. The unthreaded shank of the screw 25 projects through the flange 26 and beyond the forward

face thereof for reception of a hand wheel 27 which has marked on the periphery thereof a micrometer scale, as indicated at 28 in Fig. 2. The threaded portion of the screw 25 extending into the bore 24 engages a cylindrical nut 29 which is seated in a cylindrical recess in the carriage 9 whereby when the hand wheel 27 is turned, and with it the screw 25, the carriage 21 is moved along the guide 19. The extent of the movement of the carriage 21 may be accurately determined through the medium of the micrometer scale 28 in obvious manner.

Riveted in the carriage 21 and extending upwardly therefrom is a cylindrical pin 31 which with a screw 32 and a washer 33 forms a pivotal connection between the carriage 21 and a bracket 34, this bracket having an upwardly extending arm 35 terminating in a horizontal hollow boss 36 which normally lies with its longitudinal axis extending diagonally to and intersecting the axis of the grinding wheel 4. Mounted within the hollow boss 36 is a pin 37, which pin is secured against movement within the boss by set screws 38, 38. The pin 37 has at each end a tapered recess for reception of the tapered trunnion pins 39, 41 of a swivel head 42. The pin 39 is fixed in the head 42, while the pin 41 is threaded through one extremity of the head 42 and is secured in place by means of a lock nut 43. The head 42 is thus mounted for oscillation upon the bracket 34, and the extent of this oscillation is limited by a pair of stop lugs 44 and 45, in the manner shown in Fig. 3. Obviously the angularity of the longitudinal axis of the boss 36 with respect to the axis of rotation of the grinding wheel 4 may be varied by loosening the screw 32 and adjusting the bracket 34 around its pivot pin 31, and as shown in Figs. 1 and 2, a suitable scale 46 is provided on the carriage 21 in proximity to the bracket 34 to indicate the angle of adjustment. In the adjustment shown in the drawings, the axis of the boss 36, or in other words the axis about which the head 42 oscillates, lies at an angle of 61° to the axis of rotation of the grinding wheel, and will, by reason of its 30° angular relation to the axes of the rods 48 and 59 and of the drill, produce an included angle on the drill of 118°. It will be noted that the lugs 44 and 45 permit oscillation of the swivel head 42 through an angle of 56°, as shown in Fig. 3.

As best shown in Figs. 2 and 5, one end of the swivel head 42 is provided with an angularly offset extremity 47 which is recessed from the end for reception of an arm 48 in the form in the present instance of a cylindrical rod. That end of the rod 48 which fits within said recess is flattened, as indicated at 49 in Fig. 6, and in assembly this flat portion of the rod is engaged by the inner end of a clamping pin 51 which is threaded in a boss 52 in the offset portion 47 of the head 42, this pin functioning in conjunction with the flattened end 49 of the rod to rigidly secure the rod 48 in predetermined position to the swivel head. A pin 53 extending through the rod 48 acts as a stop to limit the extent to which the rod may be inserted in the head 42; or the rod 48 may be suitably marked to indicate the stop point.

It will be apparent that oscillation of the head 42 about its axis on the bracket 34 results in a swivel movement of the rod 48. It will be noted further that when the head 42 engages the boss 44, the rod 48 when properly mounted in the head will assume a horizontal position with its longitudinal axis intersecting the axis of rotation of the grinding wheel 4. From this horizontal position, the rod 48 may be depressed through an angle of approximately 56° or until the head 42 engages the stop lug 45, as previously described.

Fixed to the outer end of the rod 48 is the body member 54 of one element of a chuck, the function of which is to support the drill to be ground. The body member 54, see Figs. 6 to 9, inclusive, has at each side a recessed boss, 55 and 56 respectively. The boss 55 receives the rod 48, and this rod is securely anchored in the boss by means of a tapered pin 57. Similarly anchored in the boss 56 through the medium of a tapered pin 58 is a second rod 59 which extends in axial alignment with the rod 48. As shown in Fig. 7, the body member 54 has riveted therein a cylindrical pin 61, the outer end of which is threaded as shown at 62 for reception of a nut 63. This nut is locked in adjusted position upon the threaded end 62 of the pin 61 by means of a set screw 64 which is threaded through the nut for engagement with the extremity of the pin 61. The pin 61 constitutes a pivot for a hand wheel 65 which is held on the pin by the nut 63, a spring 66 being interposed between the head of the nut 63 and a washer 67, which rests in the bottom of the countersunk recess 68 in the hand wheel, and resiliently forces the hand wheel inwardly on the pin. The lower surface of the hand wheel 65 bears upon a slide plate 69, the outer offset end 71 of which constitutes one jaw of the chuck. This plate carries a pin 72 which enters a cam groove 73 in the inner face of the hand wheel 65, as shown in Figs. 7 and 8. The plate 69 bears against a second slide plate 74, which latter plate in turn bears against the inner face of the body member 54. The offset end 75 of the plate 74 forms the other jaw of the chuck. The plate 74 carries a pin 76 which extends upwardly through a longitudinal slot 77 in the plate 69 and enters a second cam groove 78 in the under side of the nut 65. The slot 77 also affords clearance through the plate 69 for the pin 61, and the plate 74 is similarly slotted at 79 for passage therethrough of the last-named pin. As previously set forth, the spring 66 forces the hand wheel 65 downwardly against the opposed face of the slide 69. The arrangement is such that rotation of the hand wheel 65 effects a movement, through the medium of the pins 72 and 76 and the cam grooves 73 and 78, of the jaws 71 and 75 toward or away from each other, depending upon the direction in which the hand wheel 65 is rotated. It will be noted by reference to Fig. 8 that the pins 72 and 76 occupy diametrically opposed positions at opposite sides of the pin 61, so that the jaws 71 and 75 are immovably locked in any position of adjustment and can be moved with respect to each other only through adjustment of the hand wheel 65.

Each of the jaws 71 and 75 carries screws 81, 81 by means of which jaw inserts 75*a* and 71*a* are secured to the respective jaws. These inserts, as shown in Figs. 6 and 9, project transversely from the jaws 71 and 75 and are formed to receive and grip the edges 82, 82 of the flutes at opposite sides of the drill, so that the drill at all times is held in a predetermined position in the chuck. It will be noted also that the ends of the jaw inserts 71*a* and 75*a* are tapered to permit engagement of these jaw elements as close as possible to the cutting end of the drill while affording clearance for the grinding operation. It will be apparent that the drill may be gripped

in the chuck or released therefrom by simple manipulation of the hand wheel 65.

The other element of the chuck, shown at the left in Fig. 6, consists of a member 83 which is slidably mounted upon the rod 59. This rod is provided with a tapered groove 84 which receives the inner end of a screw 85 threaded into the member 83 and by means of which the said member 83 may be locked in adjusted position on the rod 59 and in a predetermined position angularly of the latter. At the opposite side, the member 83 is provided with a boss 86 which carries an insert 87, the extremity of which is provided with a tapered recess 88 for reception of the extremity of the drill shank 89. The tapered recess 88 insures an accurate centering of the drill shank, the relation of the member 83 to the jaws 71 and 75 of the chuck previously described being such that the drill 89 is held necessarily in a position parallel to the common axis of the rods 48 and 59.

The predetermined positions of the chuck elements 54—83 with respect to the rods 48 and 59 and the predetermined relative position of the rod 48 with respect to the swivel head 42 are such that when the head 42 engages the stop 44, the body of the drill extends in a horizontal position with its longitudinal axis intersecting the axis of rotation of the grinding wheel 4. The angle at which the drill extends to the axis of the grinding wheel determines the angle of the point, and may be adjusted, as previously described, by releasing the screw 32 and adjusting the bracket 34 angularly about the pivot pin 31. When this angular relation has been adjusted, the lip of the drill may be brought up into engagement with the face of the grinding wheel by adjustment of the hand wheel 27, which as previously described advances the carriage 21. Assuming that contact is established when the swivel head 42 lies in engagement with the stop lug 44, the contact between the drill and the face of the grinding wheel will occur at the cutting edge of the lip. The actual grinding operation is effected by simultaneous movements of the drill through the medium of the lever 17 which traverses the drill horizontally across the face of the grinding wheel and by oscillation of the outer end of the swivel rod 59 through the angle determined by the stop lugs 44 and 45 and the swivel head 42. The angular relation and relative positions of the parts are such that this operation results in the grinding of that lip of the drill contacting the grinding wheel at the proper angle and with the correct clearance behind the cutting edge. When one lip has been ground to the required extent, the chuck is loosened and the drill turned through an angle of approximately 180° to bring the other lip of the drill into grinding position. The micrometer scale 28 upon the hand wheel 27 affords the means for feeding the drill in this position against the face of the grinding wheel to an extent insuring a length of this lip corresponding exactly to the length of the lip previously ground.

It will be noted that the provision for traversing the drill across the face of the grinding wheel insures maintenance of a flat surface on the wheel, and thereby reduces the necessity for frequent wheel dressing. It will be noted further that by resetting the drill so that each lip is chucked in the same position for grinding, identical lips and concentricity of the drill point with the axis of the drill are insured regardless of uneven wear in the chuck jaws and other parts, whereby the initial accuracy of the machine is maintained indefinitely. The machine is capable in the same operation of the rough grinds required for reclamation of badly burned or broken drills and the finish grinds required for efficient and economical regrinding of dull drills.

I claim:

1. In a drill grinding machine, the combination with a base and means on said base for supporting an electric motor, of a grinding wheel connected to said motor, a drill chuck, and a movable support for said chuck constituting a means for predeterminedly guiding the drill in contact with the grinding wheel, said chuck comprising a base member, a pair of slides mounted in superimposed position and guided for parallel movement upon said member, a jaw at an end of one of said slides, a second jaw at the adjoining end of the other slide and opposed to the jaw first named, and means for oppositely moving said slides to open and close said jaws, said means comprising a cam element rotatably mounted on the said base member and having oppositely arranged eccentric grooves, and a pin on each slide, said pins engaging in the cam grooves respectively and at diametrically opposite sides of the cam center.

2. In a drill grinding machine, the combination with a base and means on said base for supporting an electric motor, of a grinding wheel connected to said motor, a drill chuck, and a movable support for said chuck constituting a means for predeterminedly guiding the drill in contact with the grinding wheel, said chuck comprising a base member having a pivot pin projecting from a face thereof, a pair of slides mounted in superimposed position upon said face and having each a longitudinal slot for passage therethrough of said pin, a pin on each of said slides and respectively on opposite sides of said pivot, the pin on the under of said slides projecting through the slot in the overlying slide, a hand wheel rotatively engaging said pivot and having in it under side oppositely arranged eccentric grooves for reception of said pins respectively, means for retaining said hand wheel in position on the pivot, a jaw at one end of one of said slides, and a second jaw on the adjoining end of the other of said slides and opposed to the jaw first named, said slides being actuated simultaneously in opposite directions by rotation of said hand wheel and being locked by the latter against movement in either direction.

3. In a drill grinding machine, the combination with a base and means on said base for supporting an electric motor, of a grinding wheel connected to said motor, a drill chuck, and a movable support for said chuck constituting a means for predeterminedly guiding the drill in contact with the grinding wheel, said chuck comprising a base member, a pair of slides mounted in superimposed position and guided for parallel movement upon said member, a jaw at an end of one of said slides, a second jaw at the adjoining end of the other slide and opposed to the jaw first named, and means for oppositely moving said slides to open and close said jaws, the active clamping faces of said jaws being restricted in the dimension axially of the drill and being shallowly notched for reception of the edges of the flutes at opposite sides of the drill respectively whereby the clamping engagement of the jaws on the drill is confined to a limited axial area of the drill and to the edges of said flutes.

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