

July 24, 1928.

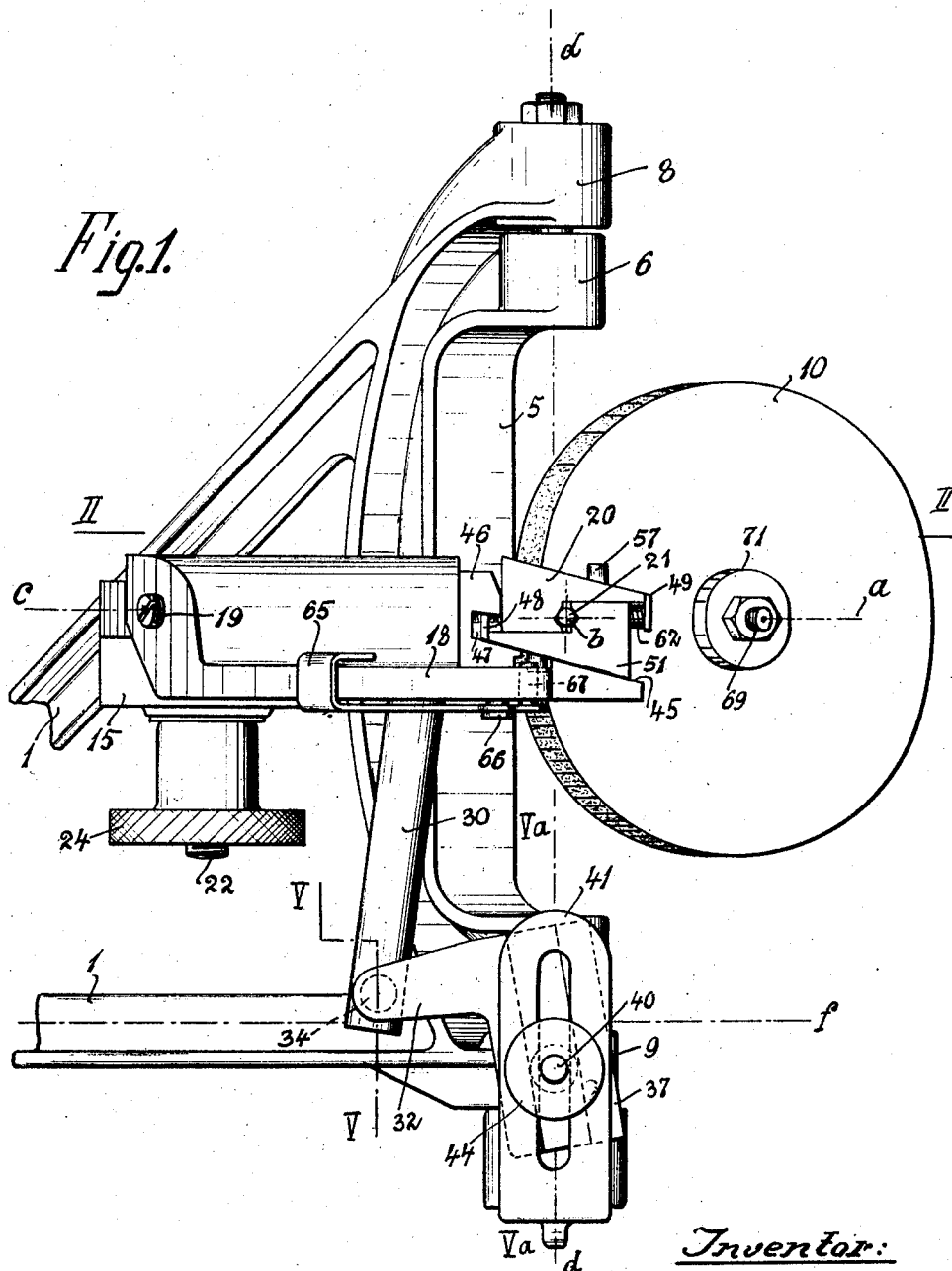
1,678,413

A. ZÄHRINGER

GRINDING MACHINE

Filed Dec. 22, 1926

4 Sheets-Sheet 1



Inventor:

Alexander Fähringer

by Kenneth
Atty.

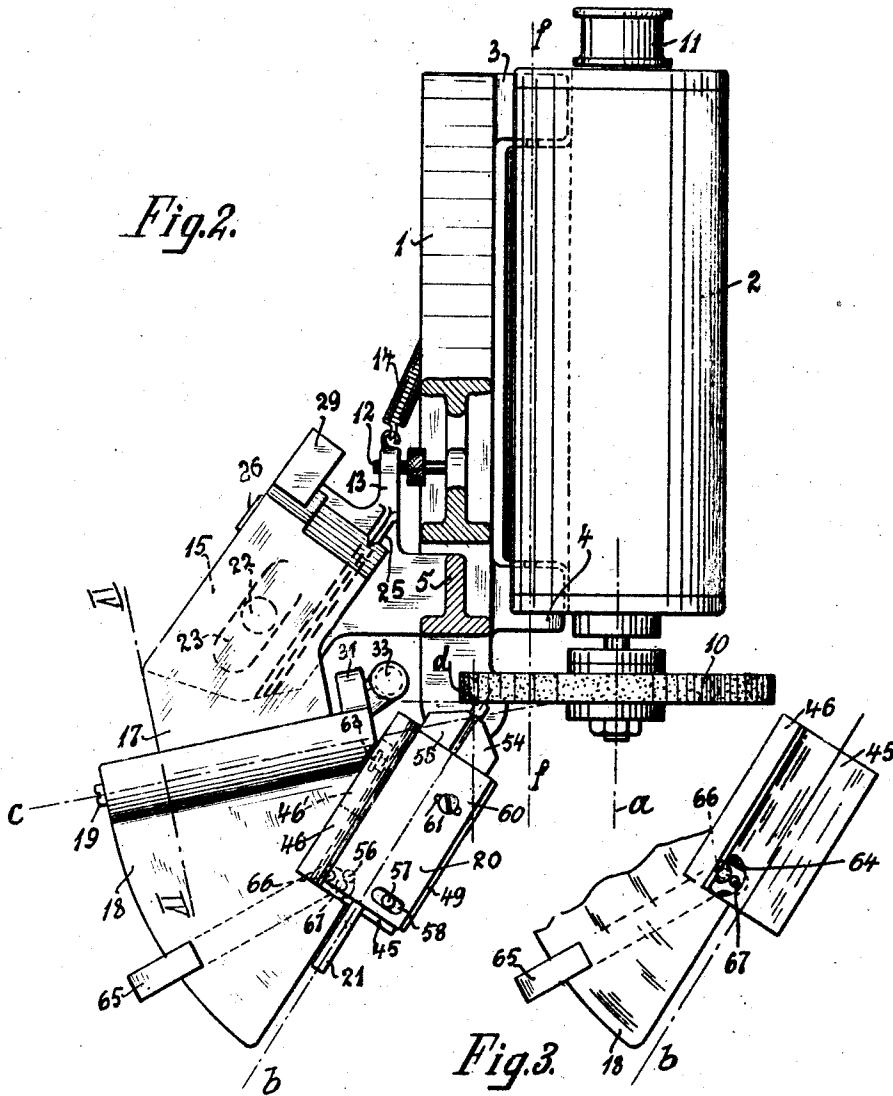
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A. ZÄHRINGER
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4 Sheets-Sheet 2



Inventor:
Alexander Zähringer
by *K. K. K.*
Atty.

July 24, 1928.

1,678,413

A. ZÄHRINGER

GRINDING MACHINE

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Fig. 4.

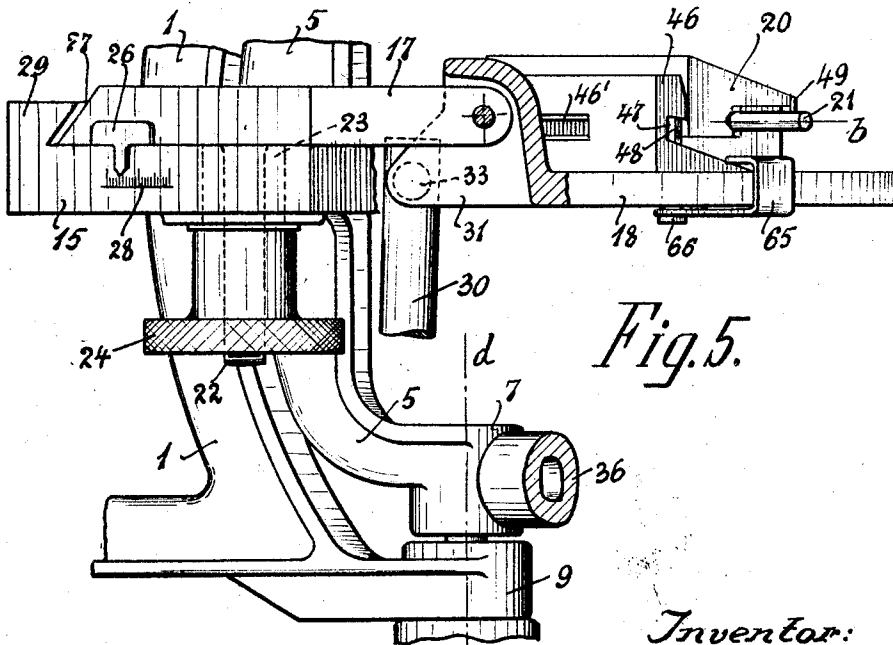
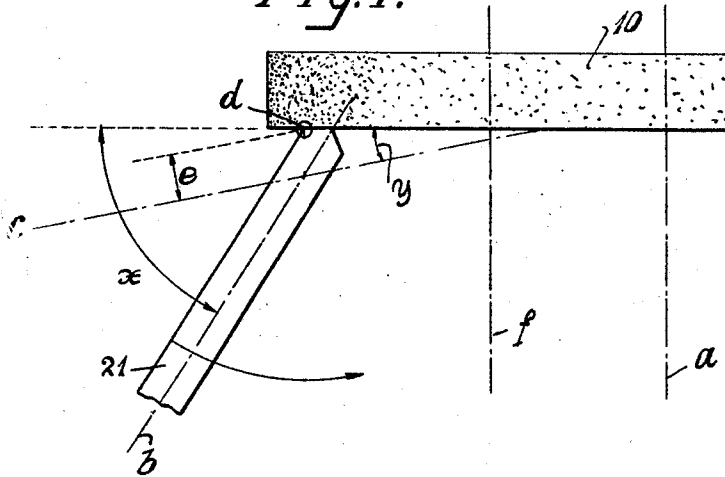


Fig. 5.

Inventor:

Alexander Zähringer

by Kirschner
Atty.

July 24, 1928.

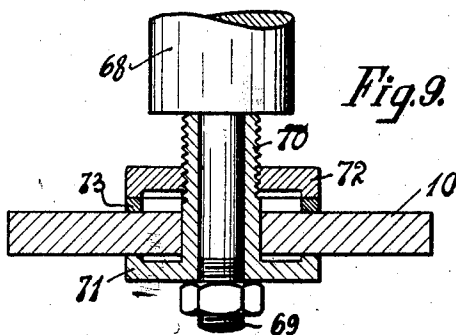
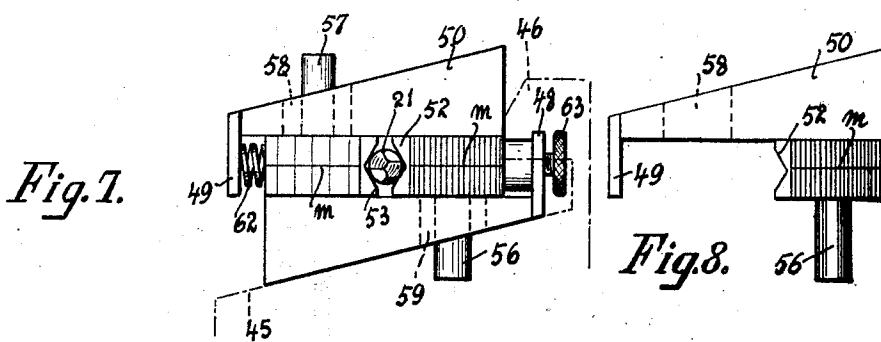
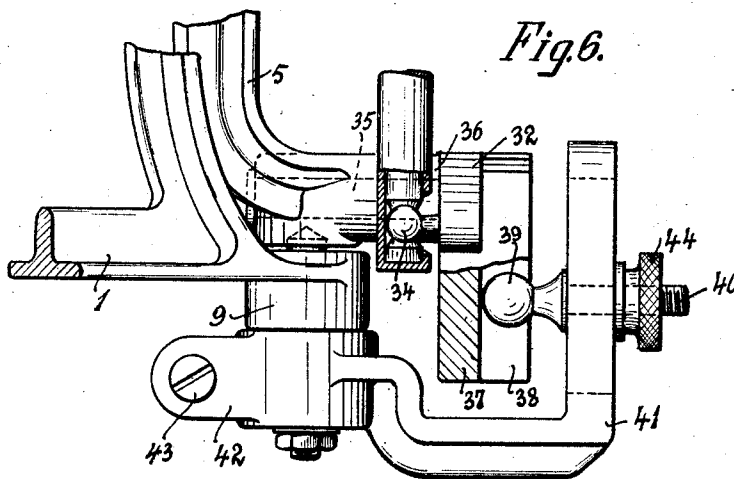
A. ZÄHRINGER

GRINDING MACHINE

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1,678,413

4 Sheets-Sheet 4



Inventor:

Alexander Fähringer

by Kumbhar's
Atty.

UNITED STATES PATENT OFFICE.

ALEXANDER ZÄHRINGER, OF STUTTGART, GERMANY.

GRINDING MACHINE.

Application filed December 22, 1926, Serial No. 156,366, and in Germany December 28, 1925.

My invention relates to grinding machines and more especially to a machine for grinding spiral drills. It is an object of my invention to provide a machine of this kind in which a suitable angle of relief is obtained without departing from a straight cutting edge. A straight cutting edge is preferable on account of its uniform distribution of forces and uniform wear, as the output of a drill is a function of uniform wear.

A straight cutting edge is not obtained in the old method in which one end of the edge is applied to the grinding wheel at the beginning of the operation and the drill is then turned so as to present gradually all points of the cutting edge to the face of the grinding wheel. In this manner a suitable angle of relief may be obtained but the cutting edge will be curved.

In my machine, on the other hand, I generate a straight cutting edge by applying the cutting edge to the face of the grinding wheel for its entire length and throughout the grinding operation.

To this end, I rock the support on which the drill is carried about an axis which intersects the face of the grinding wheel at such an angle that the cutting edge is fully applied to the face of the grinding wheel, and I rock this axis bodily about another axis which extends in the face of the grinding wheel. This axis intersects the outer end of the cutting edge and by being rocked about the point of intersection the cutting edge is provided with the required relief while still applied to the face of the grinding wheel throughout its length, and a straight cutting edge is obtained notwithstanding its being relieved.

In a preferred embodiment of my invention, I provide a support having a hinged flap. The axis of the hinge makes the said angle with the cutting edge, the drill is carried on the flap in a suitable chuck, the support is carried on a bracket which is adapted to rock about the axis which extends in the face of the grinding wheel and intersects the outer end of the cutting edge, and I so connect the flap and the bracket by a preferably adjustable mechanism that the bracket is rocked through a predetermined angle for any angle through which the flap is rocked about its hinge.

In the drawings affixed to this specification and forming part thereof a machine embodying my invention is illustrated dia-

grammatically by way of example. In the drawings

Fig. 1 is an elevation of the machine viewed in the direction of the central line of a drill inserted in its chuck,

Fig. 2 is a section on the line III—III of Fig. 1,

Fig. 3 is a detail showing the means for feeding the drill toward the grinding wheel,

Fig. 4 is a diagram illustrating the relative position of the several axes and central lines of the system,

Fig. 5 is an elevation similar to Fig. 1 but viewed in the direction of the axis about which the drill is rocked by hand, and partly in section along the line IV—IV in Fig. 2,

Fig. 6 is an elevation illustrating the mechanism for imparting rocking motion about the axis in the plane of the grinding wheel to the axis about which the drill is rocked bodily, partly in section on the lines V—V and Va—Va in Fig. 1,

Fig. 7 is an end elevation of the chuck in which the drill is secured,

Fig. 8 is an elevation showing one of the chuck jaws separately,

Fig. 9 is an axial section of the grinding wheel showing its mode of attachment to its shaft.

Referring now to the drawings, 1 is an outer bracket which is pivotally carried in the frame 2 of the machine by means of lugs 3 and 4 so that it may rock on said frame about an axis f , as best seen in Fig. 2. Its motion with respect to the frame is limited by an abutment, not shown. 5 is an inner bracket which is fulcrumed in the bracket 1 by means of lugs 6 and 7 and pins which are inserted in corresponding lugs 8 and 9 of the bracket. The axis d connecting these pins extends in the plane of the grinding wheel 10 which is rotatably carried in the frame 2 and connected with a pulley 11 to which rotation may be imparted by any suitable means, not shown. The angular relative displacement of the outer and inner brackets 1 and 5 is limited by an adjustable abutment 12 in a lug 13 of the inner bracket 5 and a spring 14 holds the abutment engaged with the bracket 1. A table 15 is cast integral with the inner bracket 5 and the lug 13 and extends horizontally from the bracket as indicated, partly in dotted lines, in Fig. 2. On this table a support 17 is carried to which a flap 18 is connected by

a hinge pin 19. The flap 18 carries the chuck 20 for the drill 21. The axis of the hinge is indicated at *c* and the central line of the drill 21 is indicated at *b*.

5 Referring now to Fig. 4, this shows diagrammatically the relative position of the several axes and the grinding wheel 10. *c* is the axis of the hinge pin 19 about which the drill 21 is rocked bodily with its chuck 20 on the flap 18. The axis *c* makes an angle γ with the face of the grinding wheel 10. *d* is the axis about which the inner bracket 5 is adapted to rock in the outer bracket 1. It will appear from Fig. 4 that this axis 15 extends in the face of the grinding wheel 10. The central line *b* of the drill makes an angle α with the plane of the grinding wheel 10. The distance *e* of the axis *c* from the axis *d* is varied in proportion to the 20 size of the drill by displacing the support on the table 15, as will be described and, in order to turn the area of the grinding wheel to better advantage the outer bracket 1 may be rocked about the axis *f*. *a* is the axis of 25 the grinding wheel 10 which extends in parallel to the axis *f* so that the angular position of the central line *b* is not varied when the bracket 1 is rocked about the axis *f*.

30 It will appear from the diagram that the cutting edge of the drill 21 is applied to the face of the grinding wheel for its entire length and that the axis *d* about which the edge is rocked for relieving, intersects the 35 outer end of the cutting edge. The opposite edge of the drill is ground in the same manner by reversing the chuck 20, as will be described.

40 22 is a pin projecting from the lower face of the support 17 and extending through a slot 23 in the table 15. 24 is a nut on the threaded end of the pin 22 by which the support 17 may be clamped in various positions on the table 15. A V-shaped ridge 45 25 is formed on the table 15 which extends in parallel to the slot 23 and engages a corresponding groove in the lower face of the support 17. The relative position of the support 17 and the table 15 is indicated by 50 an index 26 on the part 17 and a graduation 28 on the table 15. The edge of the part 17 is beveled at 27 and a parallel beveled face is formed on a lug 29 of the table 15.

55 The operative connection between the flap 18 and the inner bracket 5 is effected by a rod 30 which is pivotally connected with an eye 31 of the flap 18 and the arm 32 of an angular lever by spherical knuckles 33 and 34, respectively. The lever 32 is ful- 60 crumed on a pin 35 which is carried in a boss 36 projecting from the lug 7 at the base of the inner bracket 5. The other arm 37 of the angular lever is slotted at 38 and this slot is engaged by the spherical head 39 of 65 a pin 40. The pin 40 is adjustably carried

in a slotted U-shaped holder 41 which is se- cured to the lower lug 9 of the bracket 1 by means of a clamp 42 and a set screw 43. The pin 39 may be adjusted in the slot 70 of its bracket 41 and held in position by a knurled nut 44 or any other suitable means.

45 is an inclined face extending along one edge of the flap 18, and 46 is a straight-edge extending on the inner side of the inclined face and in parallel to the edge of the flap. 75 A slot 47 is formed in the straight-edge 46 and adapted to be engaged by jibs 48 and 49 on the chuck 20 in which the drill 21 is held.

80 The chuck 20 is made up from two jaws 50 and 51 each jaw comprising an inclined face adapted to engage the inclined face 45, a stepped parallel face adapted to engage the mating face, and a V-shaped grip 52 and 53, 85 respectively. The jaws are extended at the front ends so as to project from the body of the chuck as indicated at 54 and 55 in Fig. 2. Each jaw is provided with a pin 56 and 57, the pin of each jaw projecting through a 90 slot 58 and 59, respectively, in the other jaw. This will appear from Fig. 2 where the pin 57 of the jaw 51 is shown projecting from the slot 58 in the jaw 50. Similarly, the pin 56 of the jaw 50 projects through the slot 59 95 in the mating jaw 51. The pins 56 and 57 are arranged at the rear ends of the jaws and a screw 60 is secured in the front end of the jaw 51 and engages a slot 61 in the jaw 50 so that the jaws are guided at both ends. A 100 spring 62 which is inserted between the jib 49 of the jaw 50 engages the jaw 51, tending to hold the jaws engaged with the drill 21 when it has been inserted between the V-shaped parts 52 and 53. A screw 63 in the jib 48 of the jaw 51 serves for clamping 105 the jaws firmly in the relative position which has been imparted to them, and a slot 46' is made in the straight-edge 46 for the head of the screw.

110 In the illustrated position of the chuck, the jaw 51 is resting on the inclined face 45 and the pin 56 of the mating jaw projects into a curved slot 64 in the flap 18. A double-armed lever 65 is arranged below the part 18 and adapted to rock about a fulcrum 115 66. A pin 67 is secured in the shorter arm of the lever 65 and projects upwards through the curved slot 64 so as to engage the pin 56. By turning this lever on its fulcrum 66 in 120 anticlockwise direction the chuck 20 is pushed forward toward the grinding wheel 10.

Referring now to Fig. 9 this shows the method of securing the grinding wheel 10 to the shaft 68 of the pulley 11. A threaded 125 pin 69 projects axially from the shaft 68 and a threaded sleeve 70 is secured on the pin and engages the front face of the grinding wheel with its front plate 71. An annulus 130 72 is seated on the threaded portion of the

sleeve 70 and adapted to exert axial pressure on a washer 73 which may be of lead so as to hold the grinding wheel firmly between the parts 71 and 72.

5 The operation of my machine is as follows:

Supposing a drill 21 to be inserted in the chuck 20, in the position illustrated in Fig. 4, the chuck is placed on the face 45 of the flap 18 so that its lower jaw 51 rests on the inclined face. The chuck is held by hand so as to engage the face of the straight-edge 46. The pin 56 projects into the slot 64 and is engaged by the pin 67 on the lever 65.

15 In order to grind the drill the operator depresses the flap 18 by rocking it about its hinge 19. This motion causes the end of the drill to become engaged under a certain pressure with the face of the grinding wheel 10. Depression of the flap 18 will impart rocking motion to the inner bracket 5 through the medium of the rod 30 and the angular lever 32, 37. The angle through which the inner bracket 5 is rocked about the axis d in the bracket 1, is a function of the angle through which the flap 18 is depressed and of the ratio at which the motion of the flap 18 is transmitted to the inner bracket 5, for it will be understood that this ratio may be varied by adjusting the pin 40 and becomes 1 when the pin 40 is placed co-axially with the pin 35, so that the motion of the flap 18 will not influence the inner bracket 5 at all so that the point of the drill will be ground conically by rocking the flap 18 about the axis c but will not be relieved.

Relief is given to the grinding edges of the drill by rocking the bracket 5 about the axis d through the medium of the rod 30 and the parts connected therewith. It will be understood that by rocking the bracket 5 about the axis d , as indicated by the arrow in Fig. 4, the drill will be rocked about the outer end of its cutting edge and the extent to which this is effected and which may be determined by adjusting the pin 40 with respect to the pin 35, determines the relief.

The chuck is fed toward the wheel 10 by means of the lever 65. When one edge has been finished the chuck is reversed by placing the jaw 50 on the inclined face 45 of the flap 18, and operating as described.

In order to facilitate the operation of the machine and to enable it to be adjusted rapidly for the given size of the drill, the drill to be ground is inserted between the inclined parallel face 27 of the support 17 and the corresponding face of the lug 29 at the table 15 and the corresponding chuck is found on the graduation. Obviously the chucks for the several sizes may be numbered and the number of the chuck required for a given drill may be directly read at the graduation 28. Each chuck is so designed that the central line b of the drill is at a distance below the axis c of the hinge

19 which is at least equal to half the thickness of the drill core, and the chisel edge will be in the proper position.

According to my invention provision is made for enabling a given chuck to be adapted to several sizes or a series of drills. The chuck, when the drill is inserted, will automatically assume the correct position with respect to the axis c . This is effected by the inclined face 45 in combination with the straight-edge 46. The position of the jaw which engages the straight-edge, that is, the jaw 50 in Fig. 7, is held in an invariable position for any size of drill but the other jaw which is on the inclined face 45, the jaw 51 in Fig. 7, is displaced on the face for a distance which is a function of the drill size so that with increasing size of the drill the vertical distance between the axis c and the central line b of the drill will increase. As the two jaws engage each other with parallel faces each drill will be in the same position, as far as its cutting edges are concerned. Preferably each jaw is provided with a mark m along its central plane and when the drill is inserted between the jaws of the chuck, care should be taken that its cutting edges are substantially parallel to the marks m .

In this manner, the same chuck may be used for drills of various sizes, within comparatively wide limits, and the number of chucks to be kept in stock is reduced.

Means may be provided for varying the angle α between the face of the grinding wheel 10 and the central line b of the drill. This may be effected, for instance, by dividing the lug 7 of the inner bracket 5 so that the angular position of the bracket and the axis of the pin 35 may be varied. Means for this purpose are not illustrated as they will be obvious to any expert.

I wish it to be understood that I do not desire to be limited to the exact details of construction shown and described for obvious modifications will occur to a person skilled in the art.

I claim:—

1. Machine for grinding spiral drills comprising a frame, a grinding wheel carried in said frame, a bracket pivotally connected to said frame, and adapted to rock about an axis which coincides with the face of the grinding wheel, a support for the drill to be ground secured on said bracket and comprising a hinged flap, the axis of said hinge extending at an angle to the face of the grinding wheel, a chuck for the drill to be ground adapted to be attached to said flap, and mechanism connecting said hinged flap with said bracket so as to impart rocking motion to said bracket when said flap is turned about its hinge.

2. Machine for grinding spiral drills comprising a frame, a grinding wheel carried in

- said frame, a bracket pivotally connected to said frame, and adapted to rock about an axis which coincides with the face of the grinding wheel, a support for the drill to be ground secured on said bracket and comprising a hinged flap, the axis of said hinge extending at an angle to the face of the grinding wheel, a chuck for the drill to be ground adapted to be attached to said flap, a rod pivotally connected with said flap, a rocking lever fulcrumed on said bracket and pivotally connected with said rod and a pin connected with said frame and engaging said lever so as to form its stationary fulcrum.
3. Machine for grinding spiral drills comprising a frame, a grinding wheel carried in said frame, a bracket pivotally connected to said frame, and adapted to rock about an axis which coincides with the face of the grinding wheel, a support for the drill to be ground secured on said bracket and comprising a hinged flap, the axis of said hinge extending at an angle to the face of the grinding wheel, a chuck for the drill to be ground adapted to be attached to said flap, a rod pivotally connected with said flap, a rocking lever fulcrumed on said bracket and pivotally connected with said rod, a pin connected with said frame and engaging said lever so as to form its stationary fulcrum, and means for varying the position of said pin with regard to the fulcrum of the lever on said bracket.
4. Machine for grinding spiral drills comprising a frame, a grinding wheel carried in said frame, a bracket fulcrumed on said frame, a bracket pivotally carried in said first-mentioned bracket so as to rock about an axis which coincides with the face of the grinding wheel, a support for the drill to be ground secured on said second-mentioned bracket and comprising a hinged flap, the axis of said hinge extending at an angle to the face of the grinding wheel, a chuck for the drill to be ground adapted to be attached to said flap, and mechanism connecting said hinged flap with said first-mentioned bracket so as to impart rocking motion to said first-mentioned bracket when said flap is turned about its hinge.
- In testimony whereof I affix my signature.
- ALEXANDER ZÄHRINGER.