

No. 821,849.

PATENTED MAY 29, 1906.

G. BENICKE.
TWIST DRILL GRINDING APPARATUS.

APPLICATION FILED APR. 6, 1905.

2 SHEETS—SHEET 1.

Fig. 1.

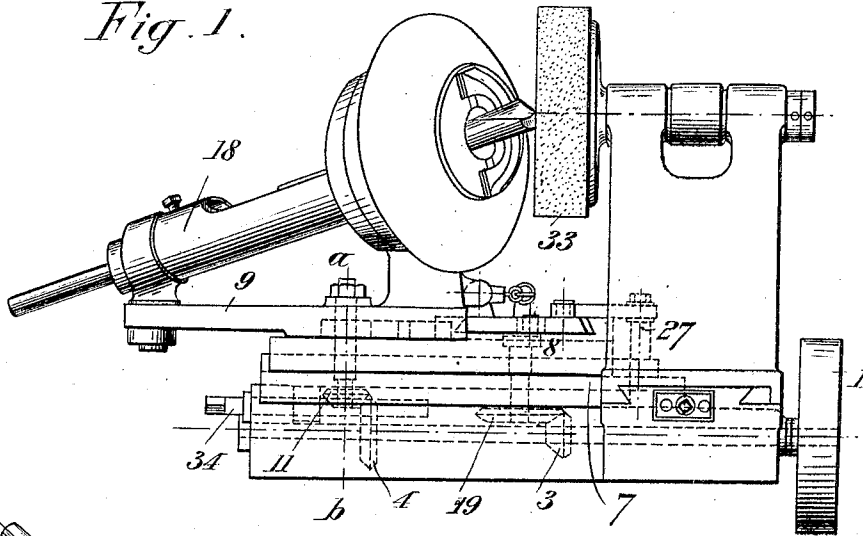


Fig. 2.

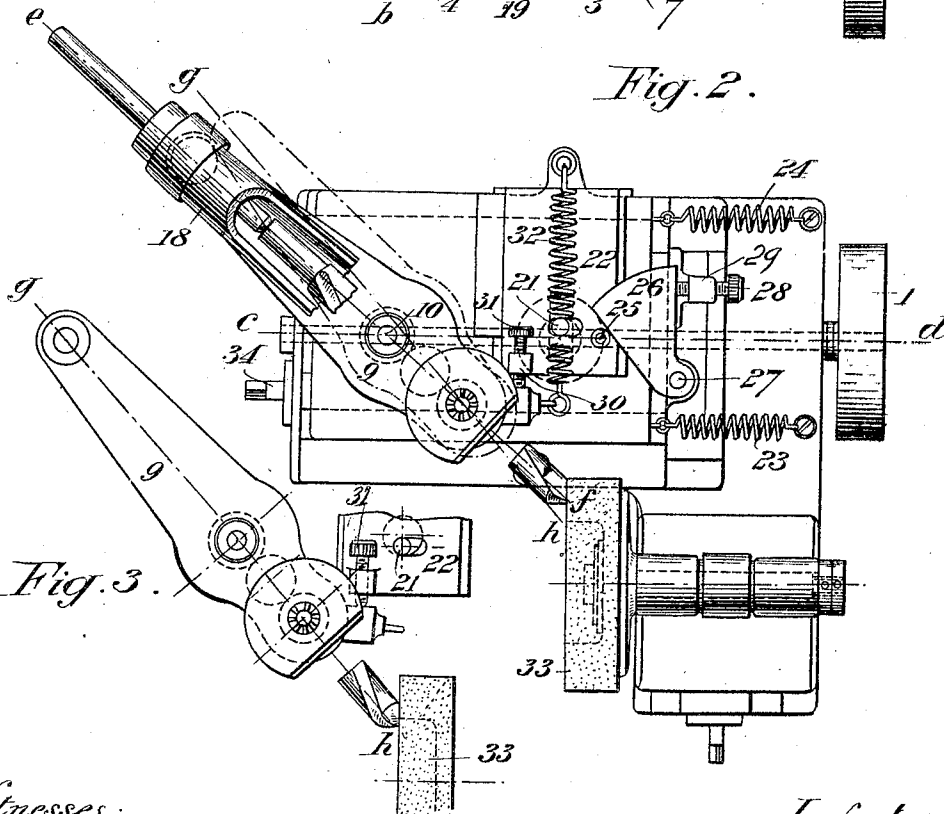


Fig. 3.

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2 SHEETS—SHEET 2.

Fig. 4.

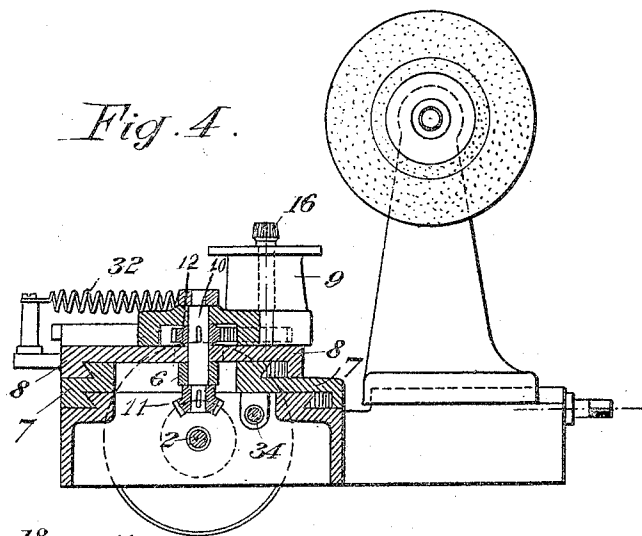


Fig. 5.

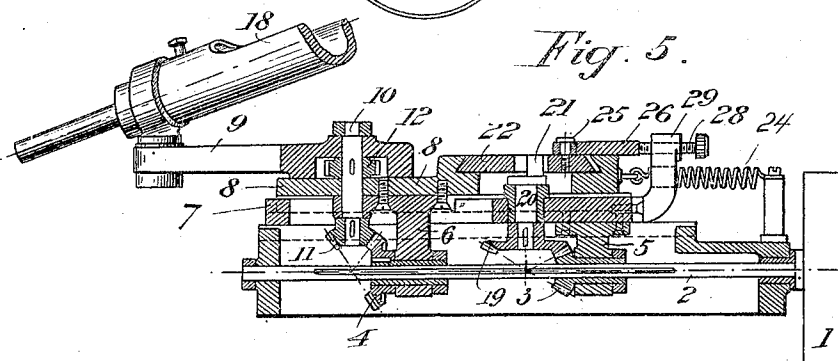
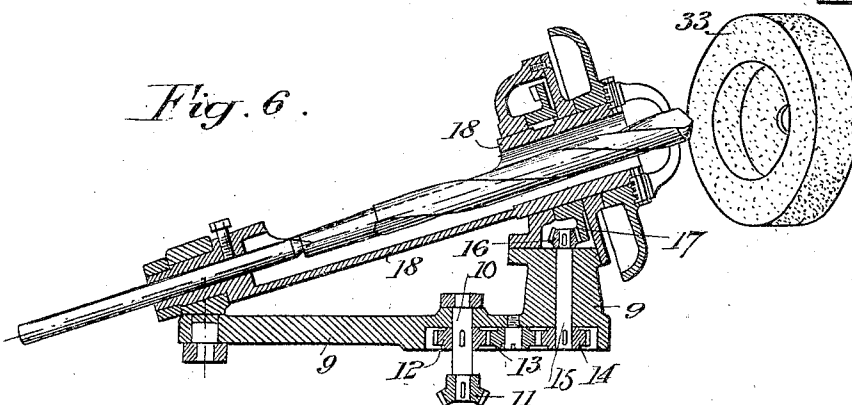


Fig. 6.



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UNITED STATES PATENT OFFICE.

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TWIST-DRILL-GRINDING APPARATUS.

No. 821,849.

Specification of Letters Patent.

Patented May 29, 1906.

Application filed April 6, 1905. Serial No. 254,121.

To all whom it may concern:

Be it known that I, GEORG BENICKE, a subject of the German Emperor, and a resident of Offenbach-on-the-Main, Germany, have invented a new and useful Twist-Drill-Grinding Apparatus, of which the following is a specification.

By means of the apparatus illustrated in the accompanying drawings twist-drills may be automatically ground in a manner similar to that effected by hand with the aid of the ordinary known twist-drill-grinding apparatus.

Advantages to be derived in the use of my apparatus are that the angle to which the point or lips of the drill are ground, as well as the amount of the "backing," may be regulated while the grinding is being effected. I am aware that there are apparatus which are intended to enable these advantages to be attained, but in their construction, as well as in their operation, they differ essentially from mine.

In the accompanying drawings, Figure 1 is a side elevation of my apparatus. Fig. 2 is a plan view showing a drill adjusted ready for the commencement of the grinding operation, one of its cutting edges or lips being shown applied to the grinding-wheel. Fig. 3 is a plan view showing the drill at the end of its circular movement. Fig. 4 is a cross-section on line *a b* of Fig. 1. Fig. 5 is a longitudinal section on line *c d* of Fig. 2, and Fig. 6 is a longitudinal section of the drill-holder on line *e f* of Fig. 2.

The construction and operation of the apparatus are as follows:

By means of a pulley 1 rotary motion is imparted to a shaft 2 and consequently also to toothed cone-wheels 3 and 4, which are slidable thereon, Figs. 1 and 5. Both the wheels 3 and 4 are provided with slidable sleeves, which are rotatably carried in bearings 5 6, which latter are fixed or screwed to two superposed supporting-plates 7 8, the bearing 5 to the lower plate 7 and the bearing 6 to the upper plate 8. The supporting-plate 7 is provided with a screwed spindle 34, whereby it may be moved in a horizontal direction, Fig. 4, and the plate 8, which is not provided with such a screwed spindle, is also adapted to be moved in a horizontal direc-

tion and is provided with springs 23 24, which tend to draw said plate rearwardly. The plate 8 is provided with a spindle 10, on which, and supported by the plate 8, an arm 9, carrying the drill support or holder, is pivotally mounted.

The spindle 10 has its bearing in the plate 8, and also in the plate or equivalent whereby the bearing 6 is fixed to said plate 8, and on said spindle 10 two wheels are mounted, on the lower end a conical toothed wheel 11, and on the upper part a toothed wheel 12, Fig. 5. The wheel 12 is situated within a recess formed in the boss of the arm 9 and serves to transmit the rotary motion of the latter to wheels 13 and 14, also carried in recesses, Fig. 6. The wheel 14 is keyed on a spindle 15, carried by an enlargement on the arm 9, and said spindle also carries at its upper end a cone-pinion 16. This pinion 16 drives a toothed wheel 17, which is fixed on the drill-holder 18 and serves to rotate the latter. In the center of the drill-holder 18 the drill 36 is fixed in any suitable known manner, the arrangement being such that said drill will be rotated with the holder, whether either the plate 7 or 8 is moved or whether the arm 9 is rotated about the spindle 10.

The cone-pinion 3 gears with and rotates a cone-wheel 19, which is mounted on a spindle 20, Fig. 5. The spindle 20 is rotatably carried by the plate 7, and its upper end is provided with a disk or the like having a pin 21 eccentrically mounted thereon. This pin engages in a slot in a plate 22, so that by the rotation of the spindle 20 said plate will be reciprocated backward and forward. The plate 22 is slidable on the plate 8, Fig. 5, and the plate 8 will be drawn or pulled rearwardly by the springs 23 24 until a roller 25 comes in contact with a segmental plate 26. This plate 26 is rotatably mounted on a bolt 27, which is fixed on the supporting-plate 7. Further, the plate 26 rests against a regulator-screw 28, by means of which said plate may be adjusted. The screw 28 is carried by a horn 29, also fixed on the plate 7, Fig. 5. At one side on the plate 22, there is a lug or equivalent 30, through which a second regulating-screw 31 passes. Against this screw 31 the enlarged part of the arm 9 is drawn by means of a spiral spring 32, said

arm, as already stated, being rotatable on the spindle 10. By means of the screw 31 the angle of the arm 9 relatively to the face of the grinding-wheel 33 is regulated.

5 The grinding is effected in the following manner: The drill is slowly rotated around its axis while it is held at an angle to the grinding-disk, about as shown in Fig. 2. The spindle 20, together with its eccentric-
 10 pin 21, is simultaneously rotated, the relative proportion of the wheels which rotate this spindle being such that when the drill makes one revolution the spindle 20 and its pin 21 have made two revolutions. In Fig.
 15 2 the drill, as already stated, is shown adjusted for the commencement of the grinding operation. By the rotation of the pin 21 the plate 22 is moved so that the regulator-screw 31 partly rotates the arm 9 around its
 20 spindle 10. By reason of the movement of the plate 22 the springs 23 24 are enabled to draw the plate 8, together with the drill-holder, to some extent in a rearward direction, so that the roller 25 is always in con-
 25 tact with the sloping or angular edge of the plate 26, whereby the angle of the drill relatively to the grinding-disk is so changed as to cause the necessary "backing" to be effected. When the eccentrically-placed pin 21 has
 30 made half a revolution, the axis of the drill will have been moved from the position *ef* (shown in Fig. 2) to that indicated by the line *gh*, the drill itself having rotated to the position shown in Fig. 3. It will thus be
 35 seen that the surface ground on the half of the drill is of spiral form, the cutting edge being ground to an angle which the line *ef* makes with the face of the grinding-disk, and this angle, as the drill slowly rotates, is grad-
 40 ually altered until at the end of the grinding stroke the axis of the drill will make an angle, (indicated by the line *gh*,) as shown in Fig. 3, with the face of said disk. The various angles, or rather this constant change in the
 45 angle from *ef* to *gh*, is essential to insure a proper cutting action of the drill. The length of the slot in the plate 22 is such that when the position shown in Fig. 3 is reached the pin 21 will prevent the springs 23 24 mov-
 50 ing said plate further. The pin 21 by moving the plate 22 also moves the plate 8, together with the drill-holder and drill, away from the grinding-disk and also the roller 25 from the plate 26. This continues until the
 55 drill has made a further quarter of a revolution, and the pin 21 consequently a half-revolution. After this the grinding of the other half of the drill, or the other cutting edge, will be effected in the manner already de-
 60 scribed.

It will be seen that the screws 28 and 31 are of considerable importance to the proper grinding of the drill. The former of these screws, by causing the angle of the sloping
 65 side of the plate 26 to be changed, deter-

mines the amount of the backing, and the latter, 31, determines the angle to which the cutting edge, relatively to the axis of the drill, will be ground. Both screws are ad-
 70 justable while the grinding is proceeding. Further, by reason of the cutting end of the drill being pressed against the grinding-disk by the spring 32 the said end may, by merely pushing against the free end of the arm 9, be
 75 moved away from the grinding-disk to permit its being inspected.

Having now fully described my said invention and in what manner the same is to be performed, what I claim, and desire to se-
 80 cure by Letters Patent, is—

1. In a device of the class described a grinding-wheel, means for rotating the grind-
 85 ing-wheel, a drill-holder, means for securing the drill in the holder, means for yieldingly forcing the drill-holder toward the grinding-wheel so as to keep the drill in contact there-
 90 with, means for rotating the drill-holder and means for vibrating the drill-holder on an axis at an angle to the axis of the grinding-wheel.

2. In a device of the class described a grinding-wheel means for rotating the grind-
 95 ing-wheel, a drill-holder, means for securing the drill in the holder, means for yieldingly forcing the drill-holder toward the grinding-wheel so as to keep the drill in contact there-
 100 with, means for automatically rotating the drill-holder, and means for automatically vibrating the drill-holder on an axis at an angle to the axis of the grinding-wheel.

3. In a device of the class described, a grinding-wheel, means for rotating the grind-
 105 ing-wheel, a drill-holder means for securing the drill in the holder, means for yieldingly forcing the drill-holder toward the grinding-wheel so as to keep the drill in contact there-
 110 with and means for automatically shifting the axis of the drill during the grinding.

4. In a device of the class described, a grinding-wheel, means for rotating the grind-
 115 ing-wheel, a drill-holder means for securing the drill in the holder, means for yieldingly forcing the drill-holder toward the grinding-wheel so as to keep the drill in contact there-
 120 with and means for automatically shifting the angle of inclination of the drill and for rotating the same during grinding.

5. In a device of the class described a grinding-wheel means for rotating the grind-
 125 ing-wheel, a drill-holder means for securing the drill in the holder, means for yieldingly forcing the drill-holder toward the grinding-wheel so as to keep the drill in contact there-
 130 with, means for rotating the drill-holder, means for vibrating the drill-holder on an axis at an angle to the axis of the grinding-wheel, and means for regulating the distance traversed by the drill-point.

6. In a device of the class described a grinding-wheel, means for rotating the grind-
 135

ing-wheel, a drill-holder, means for securing the drill in the holder, means for yieldingly forcing the drill-holder toward the grinding-wheel so as to keep the drill in contact therewith, means for automatically rotating the drill-holder, means for automatically vibrating the drill-holder on an axis at an angle to the axis of the grinding-wheel, and means for regulating the distance traversed by the drill-point.

7. In a device of the class described, a grinding-wheel, means for rotating the grinding-wheel, a drill-holder means for securing the drill in the holder, means for yieldingly forcing the drill-holder toward the grinding-wheel so as to keep the drill in contact therewith, means for automatically shifting the axis of the drill during the grinding, and means for regulating the distance traversed by the drill-point.

8. In a device of the class described, a grinding-wheel, means for rotating the grinding-wheel, a drill-holder means for securing

the drill in the holder, means for yieldingly forcing the drill-holder toward the grinding-wheel so as to keep the drill in contact therewith, means for automatically shifting the angle of inclination of the drill and for rotating the same during grinding, and means for regulating the distance traversed by the drill-point.

9. In a device of the class described, a support, a sliding plate, means for normally forcing the sliding plate toward the grinding-wheel, a vibrating lever carried by the sliding plate, a drill-holder carried by the vibrating lever, and means for vibrating the lever and rotating the drill-holder during the grinding operation.

In testimony whereof I have hereunto set my hand in presence of two witnesses.

GEORG BENICKE.

Witnesses:

KARL BROCKMANN,
JEAN GRUND.