No. 643,927. Patented Feb. 20, 1900.

O. S. WALKER.

DRILL GRINDER.

(Application filed Nov. 21, 1899.)

(No Model.)

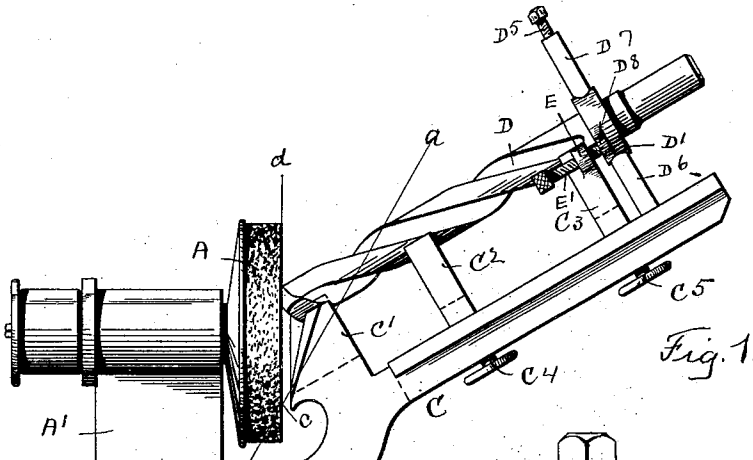


Fig. 1.

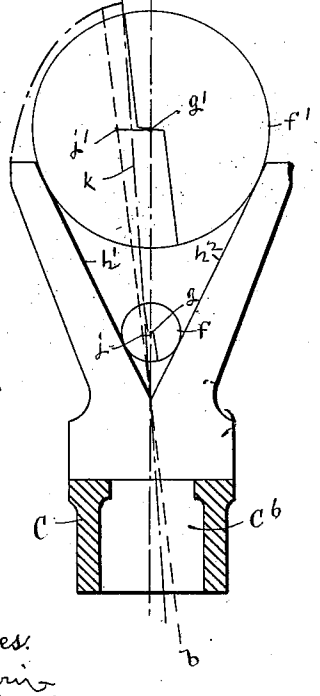


Fig. 2.

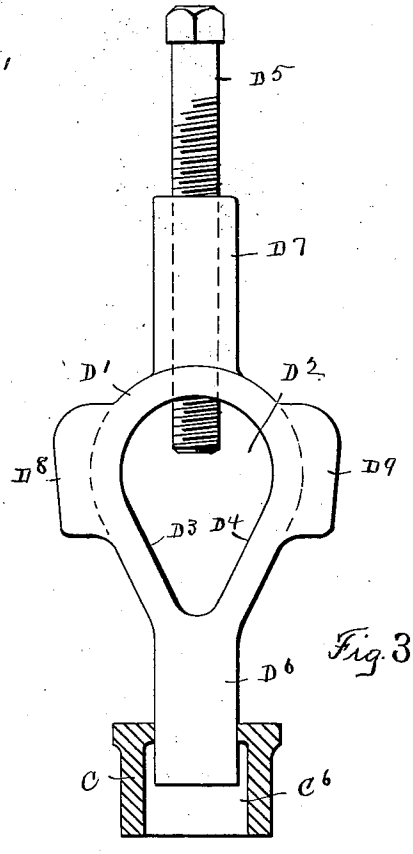


Fig. 3.

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UNITED STATES PATENT OFFICE.

OAKLEY S. WALKER, OF WORCESTER, MASSACHUSETTS.

DRILL-GRINDER.

SPECIFICATION forming part of Letters Patent No. 643,927, dated February 20, 1900.

Application filed November 21, 1899. Serial No. 737,831. (No model.)

To all whom it may concern:

Be it known that I, OAKLEY S. WALKER, a citizen of the United States, residing at Worcester, in the county of Worcester and Commonwealth of Massachusetts, have invented a new and useful Improvement in Drill-Grinders, of which the following is a specification, reference being had to the accompanying drawings, forming a part of the same, in which—

Figure 1 represents a side elevation of a drill-grinding mechanism embodying my invention, showing only a portion of the supporting post or framework. Fig. 2 is a diagrammatic view representing the relative position of a large and small drill in the drill-holder, showing the position of the drill-lips during the operation of grinding as determined by the lip-rest, with a line indicating the axis of oscillation of the drill-holder, illustrating the variation in the distance between the axis of oscillation and the axes of the drills when drills of different sizes are ground, whereby the amount of clearance is increased with an increase in the diameter of the drill; and Fig. 3 represents a dog attached to the drill during the operation of grinding in order to hold the drill from rotating and from longitudinal movement.

Similar letters refer to similar parts in the different views.

My present invention relates to that class of drill-grinders in which the drill is held in a V-shaped trough or holder and presented to the side of a revolving grinding-wheel and an oscillating or rocking motion given to the drill-holder during the operation of grinding, by which the end surface of each drill-lip is brought into contact with the grinding-wheel and ground in a curved form, determined by its radius or distance from its axis of oscillation, with a clearance to the drill-lip produced by rocking the drill about an axis of oscillation which is removed from or at one side of the axis of the drill. Drill-grinders of this class are shown and described in Letters Patent of the United States No. 411,845, granted to me October 1, 1889, and No. 425,839, granted to me April 15, 1890.

The object of my present invention is to provide a drill-grinder which shall automatically increase the radius of the drill-point as the diameter of the drill is increased and at the same time automatically increase the clearance with the increase in the diameter of the drill and also prevent water, when used with the grinding-wheel, from flowing from the point over the body of the drill, and I accomplish these results by means of the construction and arrangement of parts, as hereinafter described, and pointed out in the annexed claims.

Referring to the drawings, A denotes a grinding-wheel journaled in a supporting post or framework A′, the upper portion only being represented. Projecting from the supporting-framework is a shelf or bracket A^2, which supports a sleeve A^3 containing a bearing for a spindle B, upon which is mounted an arm B′, supporting on its upper end a drill-holder C, which comprises the V-shaped rests C′, C^2, and C^3. The V-shaped rest C′ is integral with or held in a fixed position on the drill-holder and is arranged to support the cutting end of the drill as it is presented to the side of the grinding-wheel A. The drill-supports C^2 and C^3 are preferably adjustable along the drill-holder and are held in position thereon by clamping-bolts C^4 and C^5 in the usual manner.

The drill-holder C is inclined so as to bring the axis of the drill at an oblique angle with the side of the grinding-wheel, as is usual in machines of this class, in order to give the desired bevel to the point of the drill; but instead of placing the axis of the drill at an oblique angle with the side of the grinding-wheel with the cutting end of the drill the highest, as in my two patents above referred to, I prefer to arrange the holder with the cutting end of the drill the lowest, so that when the water is used upon the side of the wheel it will not flow from the point over the body of the drill.

The drill D while being ground is held from sliding down against the side of the grinding-wheel by means of a dog D′, which is provided with an opening D^2, having V-shaped sides D^3 D^4, to receive a drill, and a clamping-screw D^5, by which the drill is clamped against the sides D^3 D^4, thereby attaching the dog to the drill. The drill-holder C is provided with a slot C^6, forming a way for the adjustable drill-rests C^2 and C^3, and

the dog D′ is provided on diametrically-opposite sides with projecting arms D^6 and D^7, adapted to enter the slot C^6 of the drill-holder and prevent the drill from turning during the operation of grinding. The arm D^6 is inserted in the slot C^6 while one drill-lip is being ground, and the drill and dog attached thereto are then turned one-half a revolution, and the arm D^7 inserted in the slot C^6 during the grinding of the opposite drill-lip.

The dog D′ is provided with laterally-projecting lugs D^8 and D^9, and the adjustable rest C^3 is provided on one side with a lug E, having a screw-threaded hole to receive an adjusting-screw E′, which is arranged to bear against the lug D^8 while one of the drill-lips is being ground and against the lug D^9 while the opposite drill-lip is being ground in order to support the weight of the drill and prevent it from sliding against the surface of the grinding-wheel.

As the drill is being ground the screw E′ is unscrewed in the lug E in order to allow the drill to be fed toward the grinding-wheel during the grinding of the first drill-lip, and the screw E′ will then act as a gage to limit the grinding of the second lip. The drill to be ground is placed in the holder with the cutting edge of one of its lips in light contact with the side of the grinding-wheel, and the drill-holder is then oscillated by rocking the spindle B in the sleeve A^3 about an axis indicated by the line *a b*. The spindle B is preferably journaled, as shown in the accompanying drawings, in a bearing at the rear of a plane containing the grinding-surface of the wheel A or upon the side of said plane opposite the drill-holder C, so that the axis of the spindle B, if produced upwardly, will pass obliquely through the plane of the grinding-surface of the wheel and below the axis of a drill held in the holder C, forming an acute angle with the plane of the grinding-surface of the wheel. The cutting end of the drill during the operation of grinding subtends the angle formed by the side of the wheel and the axis of oscillation of the drill-holder, or the angle *c d e*, Fig. 1.

The axis of each drill which is held in the holder C will be raised higher in the V-shaped supports the greater the diameter of the drill, and as the cutting-lip of each drill is in contact with the side of the grinding-wheel it follows that the greater the diameter of the drill the farther its cutting end will project over the axis of oscillation, and consequently the greater will be the radius of the ground surface of the lip, and in order to cause the drills to be raised in the holder the proper distance, as determined by their diameters, I construct the V-shaped drill-supports with their sides at an acute angle, preferably about fifty-two degrees, in order to secure the proper elevation of the drill above the bottom of the V-shaped supports corresponding to the diameter of the drills to be ground.

During the operation of grinding the drill, with its cutting end in contact with the side of the grinding-wheel, is oscillated about an axis coincident with the line *a b*, thereby producing a curved ground surface on the end of the drill, the curvature being determined by its radius or the distance the end of the drill projects over its axis of oscillation. Although the acute angle *c d e* included between the axis of oscillation *a b* and the plane of the side of the grinding-wheel in contact with the end of the drill remains constant, the distance between the axis of oscillation and the side of the wheel will increase the farther the drill is held from the intersection of the line *a b* with the plane of the side of the wheel. The larger the drill the greater should be the radius of the curved ground surface on the end of the drill, and I secure an increase in the radius of the ground surface corresponding with the increase in the diameter of the drill by placing the sides of the V-shaped drill-supports at such an acute angle that the drills will be held at a higher elevation as their diameters increase. The proper angle, as determined by experiment, I have found to be about fifty-two degrees.

In order to produce what is known as a "clearance" on the ground surface of the drill, the drill is moved slightly toward the grinding-wheel as it is oscillated, and this movement is secured by supporting the drill in its holder so that the axis of the drill will be at one side of its axis of oscillation, as described in the Letters Patent of the United States No. 411,845, granted to me October 1, 1889. In the drill-grinder herein described I cause the amount of clearance to be automatically increased with each increase in the diameter of the drill to be ground by means of a novel disposition of the acute-angled drill-supports relatively to the axis of oscillation, as illustrated by Fig. 2 of the drawings and hereinafter described.

In the diagrammatic view Fig. 2 the circles *f* and *f′* denote, respectively, a small and a large drill held in the V-shaped support, with the axes of the drills (denoted by the points *g g′*) lying in a line *h* bisecting the angle formed by the sides *h′ h²* of the drill-support, and the drill-holder is so mounted upon the arm B′ that its axis of oscillation will pass to one side of the plane denoted by the line *h* containing the axes of the drills, and the axis of oscillation forms an acute angle with the plane bisecting the angle of the sides *h′ h²* of the V-shaped supports, so that the higher the drill is raised in the holder the greater the distance between the axis of the drill and its axis of oscillation, causing a greater clearance to be given to the drill-lip the greater the diameter of the drill to be ground.

Referring to the diagrammatic view Fig. 2, the oscillation of the smaller drill *f* about the axis of oscillation indicated by the line *a b* will cause its lip to be ground with a clearance due to the eccentricity of the axis of oscillation to the axis of the drill or the

distance between the axis g of the drill and the point j in the axis of oscillation, while the larger drill f' will have an increased clearance due to the increased distance between its axis g' and the point j' in the line $a\ b$. By properly apportioning the angle between the axis of oscillation and the side of the grinding-wheel and the angle formed by the sides of the V-shaped supports drills of different diameters will be accurately ground having the proper curvature and proper clearance of the ground surface of the lip without any adjustment of the operating parts of the machine.

In Fig. 2 I have shown the corners of the drill-lips of both the larger and smaller drills $f\ f'$ in contact with a lip-rest, which is indicated by the link k, and having an inclined contact edge adapted to drills of different diameters. Such a lip-rest was shown in my Patent No. 411,845 and forms no part of my present invention. Instead of using a lip-rest, as shown, the drills can be so held in the dog D as to properly present their lips to the grinding-wheel.

In the accompanying drawings I have shown the drill-holder inclined so as to hold the cutting end of the drill which is in contact with the grinding-wheel the lowest for the purpose of preventing water used on the grinding-wheel from flowing down the body of the drill. The novel arrangement of parts by which I automatically secure an increase in the clearance of the drill and also an increase in the radius of curvature of the ground surface of the drill does not depend, however, upon such a disposition of the drill-holder as shall bring the cutting end of the drill the lowest.

In order to increase the radius of the ground surface of the drill, I cause the cutting end of the drill to project beyond its axis of oscillation when brought into contact with the side of the grinding-wheel, and I cause its axis of oscillation produced to intersect the plane of the side of the grinding-wheel and form an acute angle therewith, which is subtended by that portion of the drill lying between the axis of oscillation and the side of the grinding-wheel and with the drill held in a V-shaped support whose sides form such an acute angle with each other that the drills will be raised in the holder as their diameters increase. The amount of clearance is increased with the increase in the diameter of the drill by so disposing the V-shaped drill-support relatively to the axis of oscillation that the distance between the axis of the drill and the axis of oscillation will be increased as the drills increase in diameter.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a machine for grinding twist-drills, the combination of a revolving grinding-wheel, an oscillating drill-holder pivoted upon the supporting-framework of the machine so that its axis of oscillation, produced, will intersect the plane of rotation of the surface of the grinding-wheel, in contact with the drill, and form an acute angle therewith, and an acute-angled V-shaped drill-support by which the drill to be ground is held in contact with the grinding-wheel with the end of the drill subtending the acute angle formed by the intersection of its axis of oscillation with the plane of rotation of the surface of the grinding-wheel in contact with the drill, whereby an increase in the diameter of the drill will increase the radius of curvature of the ground surface of the drill-lip.

2. The combination of a grinding-wheel, a drill-holder, V-shaped supports for holding the drills to be ground with their axes in a plane bisecting the angle formed by the sides of the V-shaped supports, said drill-holder having a rocking or oscillating motion by which the ground surface of the drill-lip is carried into contact with the grinding-wheel, with its axis of oscillation passing to one side of the plane bisecting the angle formed by the V-shaped supports and forming an acute angle therewith, substantially as described.

3. The combination of a grinding-wheel, a drill-holder having V-shaped supports for the drill to be ground, said drill-holder being journaled in bearings, and having an axis of oscillation which passes through the apex of the angle formed by the sides of said V-shaped supports, and at an acute angle to a plane bisecting the angle formed by the sides of the V-shaped supports, whereby an increase in diameter of the drill to be ground will increase its clearance, substantially as described.

4. The combination with a grinding-wheel, of a drill-holder, having V-shaped supports and a dog attached to the drill held in said supports provided with diametrically-opposite arms adapted to engage the drill-holder as the drill is turned therein to grind its opposite lips, substantially as described.

Dated this 18th day of November, 1899.

OAKLEY S. WALKER.

Witnesses:
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PAULINE WINKLER.