No. 607,306. Patented July 12, 1898.

O. S. WALKER.

TWIST DRILL GRINDING MACHINE.

(Application filed Sept. 13, 1897.)

(No Model.)

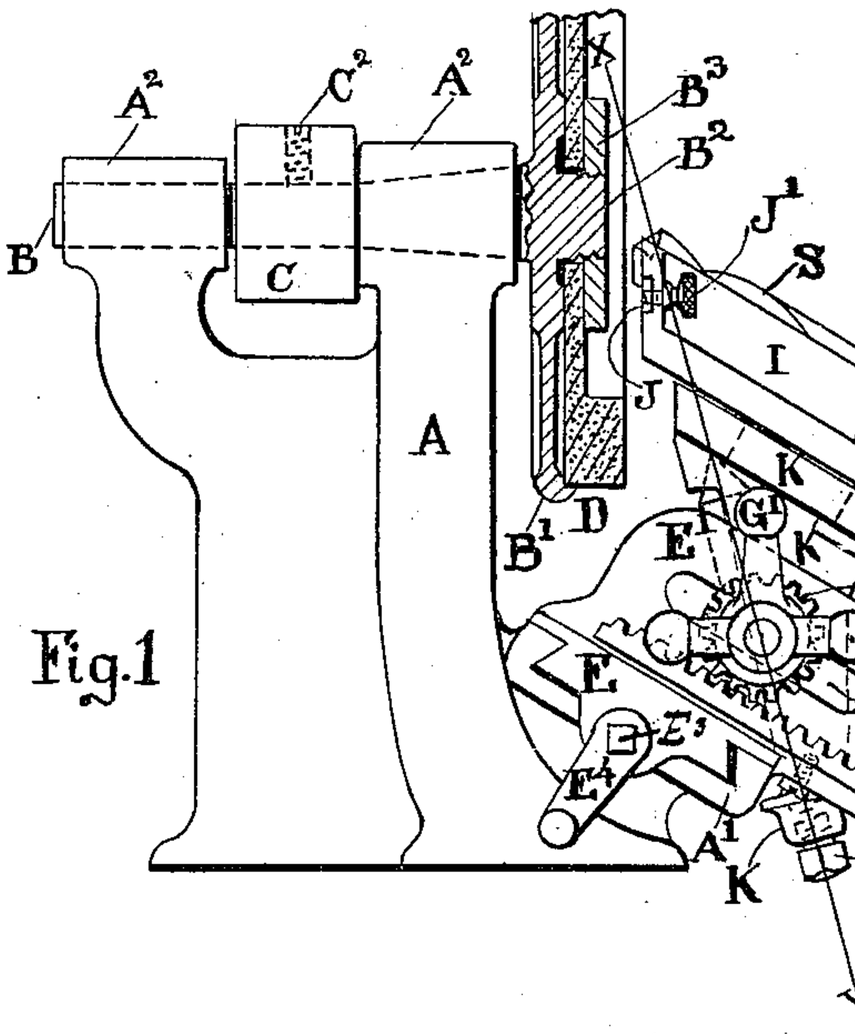

Fig.1

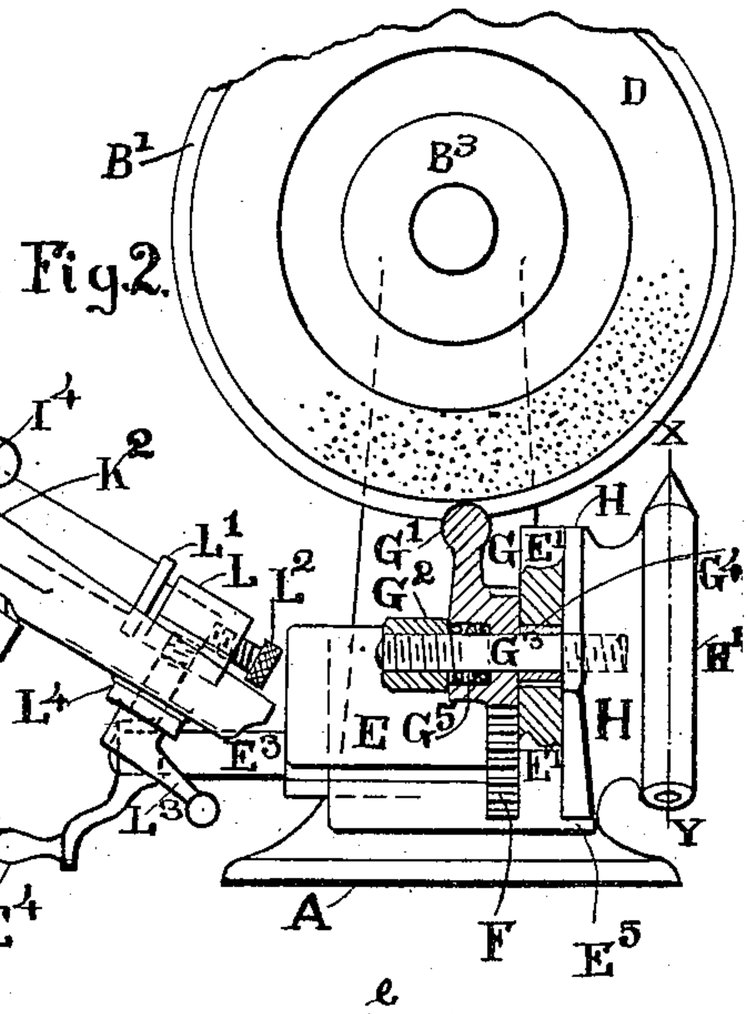

Fig.2

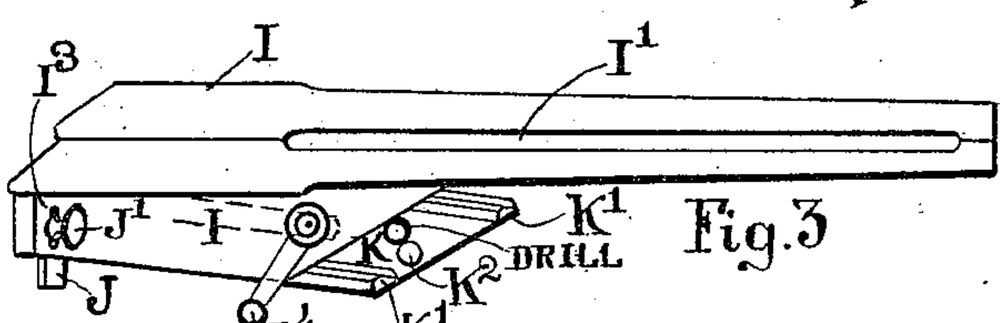

Fig.3

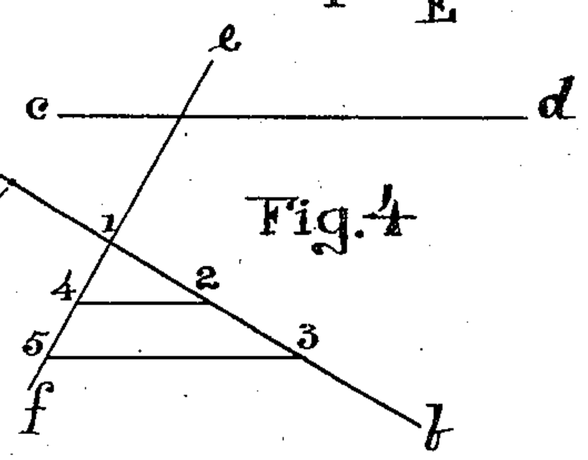

Fig.4

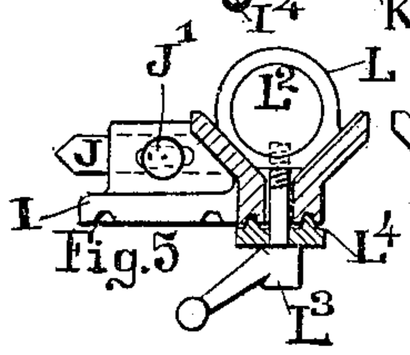

Fig.5

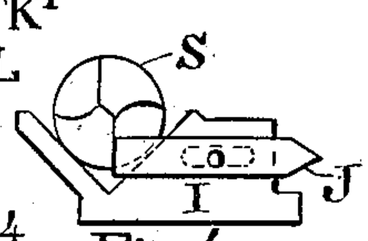

Fig.6

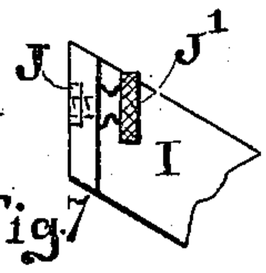

Fig.7

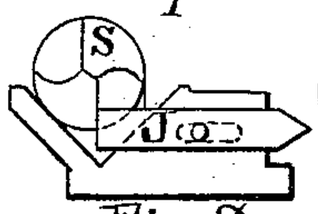

Fig.8

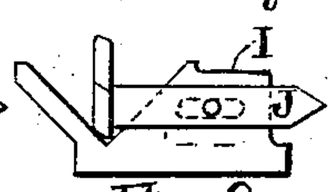

Fig.9

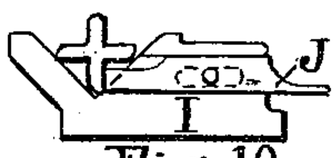

Fig.10

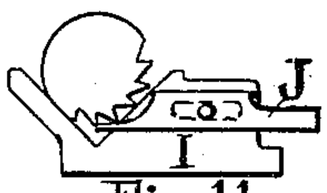

Fig.11

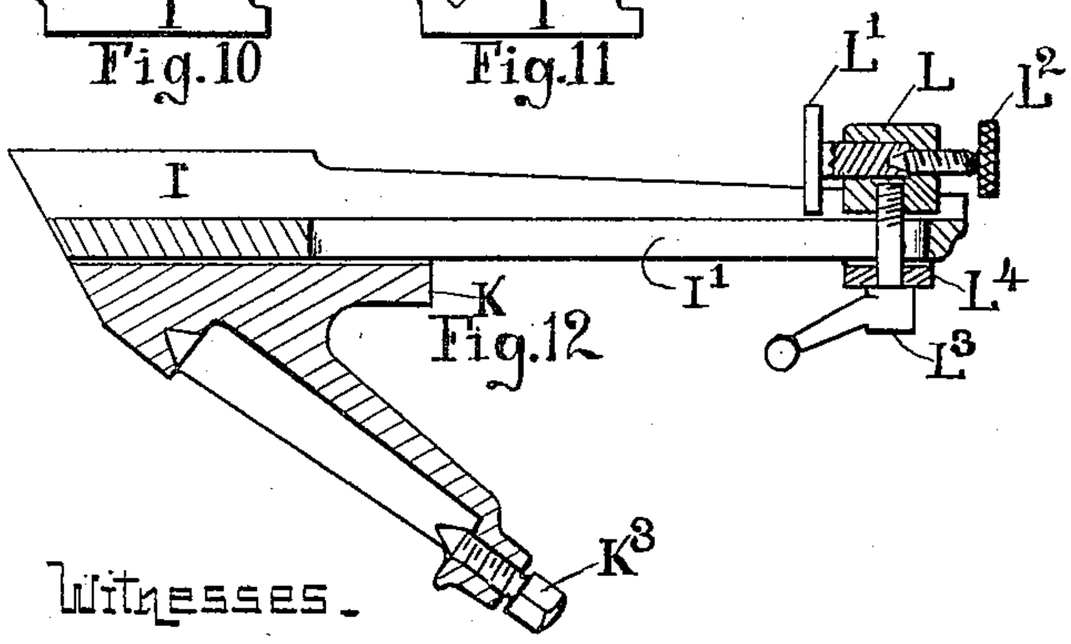

Fig.12

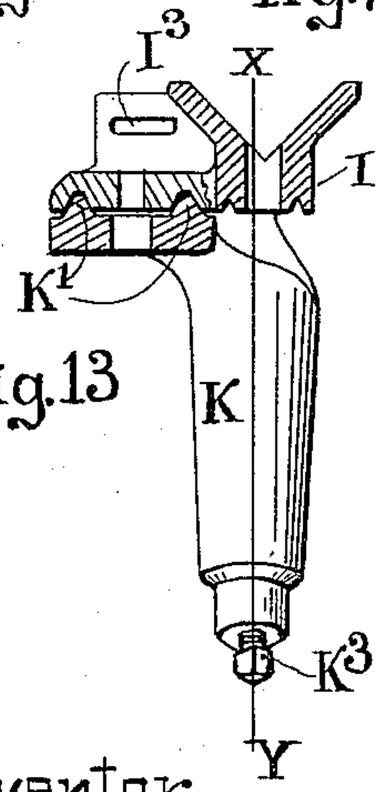

Fig.13

Witnesses.

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UNITED STATES PATENT OFFICE.

OAKLEY S. WALKER, OF WORCESTER, MASSACHUSETTS.

TWIST-DRILL-GRINDING MACHINE.

SPECIFICATION forming part of Letters Patent No. 607,306, dated July 12, 1898.

Application filed September 13, 1897. Serial No. 651,557. (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 State of Massachusetts, have invented certain new and useful Improvements in Twist-Drill-Grinding Machines, of which the following is a specification.

Among the objects of my present invention may be mentioned improved devices for holding, adjusting, and grinding twist-drills, straight-fluted drills, and flat drills, such as are commonly used for metal-drilling. These drills, previously ground almost entirely by hand, are now by the advancement of the art usually held in a pivoted chuck with the end of the drill adjusted in a certain definite position from the chuck-pivot eccentric to the same, so that as the chuck is swung about its pivot in front of a grinding-wheel the drill is presented to the wheel in such manner as to be ground to the proper contour for clearance in cutting. In my Patents No. 411,845, of October 1, 1889, and No. 425,839, of April 15, 1890, I have shown and described devices for accomplishing these ends. My present invention has to do with similar devices of a simplified and improved nature; and to this end my invention consists of the new and novel features described hereinafter.

Referring to the accompanying drawings, like figures and letters of reference indicating like parts, Figure 1 is a side elevation, partly in section, of my improved drill-grinding machine with a drill in place in the holder. Fig. 2 is a front end elevation with a part of the drill-adjusting mechanism in section and the swinging part of the drill-holder removed. Fig. 3 is a plan view of the swinging part of the drill-holder, illustrating the method of setting same for a drill. Fig. 4 is a diagram illustrating the method of setting the drill-holder for the various-sized drills. Fig. 5 is a rear end view, partly in section, of the swinging part of the drill-holder; and Figs. 6, 7, 8, 9, 10, and 11 are detail views of same, illustrating the operations of the drill-lip rest. Fig. 12 is a part vertical section through the drill-holder, showing the feeding mechanism and the pivot-bearings. Fig. 13 is a rear end view of the drill-holder and the pivoted drill-holder support, partly in section.

A is the main supporting-stand of the machine, provided with a projecting bracket A′ for the reception of a slide and the drill-holding mechanism.

B is the grinding-spindle, running in bearings A^2 of the stand A.

The spindle B is driven by a belt on the pulley C, fastened to the spindle by the set-screw C^2. One end of the spindle B is provided with a chuck B′, recessed for the reception of the back edge of the emery-wheel D and closely fitting the same, thus providing a safety-guard to prevent the bursting of the wheel. The spindle B is also provided with an externally-threaded projecting end B^2, upon which is mounted the nut B^3 for holding the wheel D in place longitudinally.

Upon the projecting bracket A′ is mounted the inclined slide E, operated transversely by the screw E^3 and crank E^4.

At the right-hand end of the inclined slide E is a slotted vertical projection E′, also inclined, upon which is adjustably mounted the longitudinal slide H, which is provided at one side with the pivot H′ for the swinging drill-holder. This slide H is held against the slotted vertical projection E′ by means of the nut G^2 and the stud G^3, threaded into H and passing through the aforesaid slot, clamping the slide H in place at will. Upon the stud G^3 and between the nut G^2 and the clamping-surface is loosely mounted the pinion G, provided at one side with an operating-handle G′. Upon the transverse slide E is mounted a stationary rack F, in mesh with the pinion G.

The weight of the longitudinal slide H and its parts is supported by a horizontal projecting surface E^5 of the slide E. (See Fig. 2.) To prevent a lifting tendency of the slide H while being adjusted, a roller G^4 is provided, rolling easily upon the stud G^3 between the walls of the slot E^6 in the part E′ aforesaid and bearing only upon the top surface of said slot. (See Fig. 2.)

It will be noticed that the direction of movement of the longitudinal slide H is inclined from a horizontal plane. The object of this inclination will be explained hereinafter. To prevent the slipping back of the slide H on the said incline when the nut G^2 is loosened, a coil-spring G^5 is provided which is recessed

into one side of the pinion G and bears against the nut G^2. It is made with sufficient tension to create the necessary friction to hold the parts in place when the nut G^2 is slackened.

Upon the pivot H′ is mounted the drill-holder support K, pivoted on pointed bearings at the top and bottom and having adjustment for wear by means of the pointed screw-threaded bearing K^3 at the bottom. The top surface of the support K is provided with V-shaped ways or tracks K′, fitting corresponding grooves in the bottom of the sliding drill-holder I. A great advantage attained by this construction is the prevention of slack motion due to wear when in use, which would cause inaccuracies in the clearance of drills ground. The lower portion of the support K is in the form of a hollow cylinder with part of one side cut away for the reception of the pivot H′.

The top of the drill-holder support K is provided between the tracks K′ aforesaid with a slot for the reception of a bolt I^5, which passes through a hole in the drill-holder I and is provided with a nut I^4 for clamping the drill-holder I to the support K in any desired position at will. The support K is also provided upon its top surface with a projecting pin K^2 beyond the surface covered by the drill-holder I. The object of this pin will be explained farther on.

The drill-holder I is provided with a continuous V-shaped trough its entire length to retain the various-sized drills. A portion of this trough is provided with a longitudinal slot I′, extending completely through the drill-holder vertically. This slot is for the reception of a binding-screw L^3, which enters from the under side and is threaded into the sliding tail-stock L. By this means the said tail-stock can be moved along and clamped in any desired position.. The tail-stock L is fitted to conform to the shape of the V-trough at its base, and it is evident that when it is clamped in place all lost motion will be taken up, also that its tendency will be to spread the trough apart in some degree, which would be objectionable. To overcome this fault, I groove the under side of the drill-holder upon each side of and parallel to the slot I′. A sliding shoe L^4 is provided with raised tracks to fit the aforesaid grooves. This shoe forms a bridge across the slot I′ and a washer for the binding-screw L^3 and prevents the spreading of the holder when the said screw is tightened. By this arrangement the advantages of a slotted V-shaped trough for a tail-stock or stop is obtained which would otherwise be impracticable.

L′ is the feed-plunger, provided at one end with a flanged portion fitting the V-trough and forming a stop for the drill, the other end sliding in a hole in the tail-stock L and being fed out by the feed-screw L^2, which has a tapered point fitting a like-tapered recess in the end of the feed-plunger. The object of this construction is to provide an easy means of creating a friction to hold feed-screw L^2 more securely in place.

At the left of the V-shaped trough and near the upper end the drill-holder is supported on the V-shaped ways on top of the support K, as previously described. The movement of the drill-holder upon these ways, which are inclined horizontally to the axis of the drill, determines the varying clearance of different-sized drills, the principle of which has been applied to many other drill-grinding machines and is fully explained in my Patent No. 411,845, dated October 1, 1889, Sheet 2, Fig. 6, of specification, line No. 95.

The end of the drill-holder over the V-shaped ways K′ above mentioned is beveled off at an angle both to the said ways and to the axis of the drill. This end of the drill-holder and the pin K^2 have an important bearing on the setting of the drill-holder for varying sizes of drills. The drill to be ground is first inserted between the pin K^2 and the end of the drill-holder and determines the longitudinal adjustment of the holder upon the V-shaped ways K′, before mentioned.

Referring to the diagram Fig. 4, the pin K^2 is represented by a point. *c d* is the line of adjustment for the drill-holder longitudinally on the V-ways, and *e f* the line representing the end of the drill-holder or line of drill contact. The line *a b*, drawn through the pin K^2, is perpendicular to the end of the drill-holder or line *e f*. It is evident that the shortest distance from the pin K^2 to the line *e f* will be measured upon the line *a b*. Hence the centers of all drills inserted between K^2 and *e f* will lie somewhere in the line *a b*. The distance K^2 to 1 equals one inch, K^2 to 2 equals two inches, and K^2 to 3 equals three inches. These distances will represent diameters of drills of corresponding sizes. Assume diagram to represent the setting of the drill-holder for drills one inch in diameter. The point of drill contact on line *e f* will evidently be at 1. From the points 2 and 3 draw lines parallel to *c d*, (the line of adjustment,) meeting *e f* in points 4 and 5. It is evident that in setting the holder for a two-inch drill the point 4 will coincide with the point 2, and hence point 4 will be the point of drill contact for a two-inch drill and, similarly, point 5 will be carried to point 3 and come in contact with a three-inch drill. Thus it is evident that no two drills of different diameter can have the same point of contact upon the end of the drill-holder. The wear is thus distributed, and a variable setting can be provided for by forming the drill-holder end to a curve. In my Patent No. 425,839, of April 15, 1890, I have shown and described a pair of projecting angular caliper-jaws made parallel. The difficulty encountered is in the binding of the drills between these jaws, making them difficult of removal after the holder is clamped. In my present device, the pin K^2 having but a single line of contact for all

sizes of drills, the least lateral motion of the drills will free the same, and little care is necessary in machining the surfaces.

The end of the drill-holder I which abuts on the emery-wheel is provided with a shallow horizontal groove for the reception of the adjustable drill-lip rest J, held in place by the screw J′, threaded into same, and which passes through a slot I^3 in the end of the drill-holder, binding the lip-rest firmly against the same when desired. This rest is adjustably fitted in the groove aforesaid and can be horizontally adjusted without changing its angularity. Thus if the rest should become worn it can simply be moved along and clamped in a new position or to bring the line of drill contact in the original position. Furthermore, I make the lip-rest reversible and double-ended, so that different-shaped ends can be employed at will. In Fig. 6 is shown a square-ended lip-rest set for an ordinary two-lipped twist-drill. In Fig. 8 is shown the same lip-rest adjusted to throw the drill out of center of the V-trough. By this means I am enabled to obtain an increased clearance upon any drill at pleasure, as the same is thus set with greater eccentricity to the holder-pivot. Fig. 9 shows the operation of the square-ended lip-rest to the setting of a flat drill, and Fig. 10 the same for a four-lipped drill. Fig. 11 shows the lip-rest reversed and a pointed end employed for a multiple-toothed drill or reamer.

The operation of my improved twist-drill grinder is as follows: The nut G^2 is loosened, and by means of the handle G′ of the pinion G the drill-holder I and support K are drawn back with the slide H some distance away from the emery-wheel and temporarily clamped by the nut G^2. The clamping-nut I^4 is now loosened and the drill-holder moved ahead by hand till the drill to be ground can be inserted between the pin K^2 and the end of the drill-holder. (See Fig. 3.) The drill-holder is now clamped rigidly in place by the nut I^4 and the drill is laid in the V-trough with the cutting end projecting past the lip-rest J a slight distance and the edge of the drill-groove in contact with the said rest. The tail-stock is now moved up and clamped with the sliding plunger L′ in contact with the shank of the drill. With the right hand holding the drill and holder loosen the nut G^2, and with the handle G′ move the drill and holder up into light contact with the grinding-wheel and tighten nut G^2. While the right hand holds the drill in place, with the left hand on the feed-screw L^2, swing the holder and drill past the face of the grinding-wheel D, at the same time feeding the drill to the wheel the desired amount for sharpening same by means of the screw L^2 aforesaid, reversing the lips of the dril frequently to grind same of equal length. To carry the work to a different part of the surface of the grinding-wheel, the transverse slide E is moved by the crank-handle E, which actuates a feed-screw in any usual and convenient manner to move the same. Should it now be desired to grind a larger drill than the one previously ground, the same operation is gone through with as above described, and it will be found that the pivot H′ is farther away from the drill-point and the grinding-wheel than in the previous case when the drill is set ready to grind. This is obvious from the foregoing description. It follows then that as the adjustment away from the emery-wheel is inclined downward the slide H and pivot H′, carrying the drill and holder, are also lower than in the previous position. The object aimed at by this construction is to maintain all drill-points in approximately the same horizontal plane. The inclination of the line of longitudinal adjustment of the slide H will compensate for the unavoidable elevation of drills in the V-grooved trough as the diameters increase.

In all previous drill-grinding machines of this nature no provision has been made to remedy this difficulty, and large-sized drills are carried nearly out of range of the grinding-wheel.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent in the United States, is as follows:

1. In a drill-grinding machine the combination of a continuous V-shaped trough for holding the drills, a longitudinally-adjustable tail-stock fitting the said trough for feeding the drills to a grinding-wheel, and an adjustable drill-lip rest for setting the drill in proper position, the direction of the lip-rest adjustment being across the V-shaped trough to provide for a variation of the clearance of the drill-lips substantially as shown and described.

2. In a drill-grinding machine, the combination of a slotted V-shaped trough for holding the drills, the said trough being provided with parallel grooves longitudinally, a tail-stock adjustably mounted in the said trough and clamped by a screw through said slot and a bridge-piece or washer spanning said slot and provided with lugs or ways fitting said grooves, said bridge-piece being perforated for the tail-stock binding-screw and preventing the spreading of the trough when said binding-screw is tightened, all substantially as set forth.

3. In a drill-grinding machine the combination of a continuous V-shaped trough for holding the drills and the feeding tail-stock, a reversible drill-lip rest and a pivoted drill-holder support provided with V-shaped ways at the top upon which the drill-holder trough is adapted to be adjusted as and for the purpose described.

4. In a drill-grinding machine the combination of an adjustable drill-lip rest, a V-grooved drill-holder with beveled end and a pivoted drill-holder support provided with a stop or pin from which, measuring from the said beveled end of drill-holder the setting of

the drill-holder is determined for the different-sized drills substantially as shown and described.

5. In a drill-grinding machine the combination with the drill-holder and drill-holder support of a pivot and longitudinal feed-slide whose line of adjustment away from the grinding-wheel is inclined downward from a horizontal plane for the purpose above set forth.

6. In a drill-grinding machine the combination of a V-grooved drill-holder, a pivoted drill-holder support, and a longitudinally-adjustable pivot-slide, adjustable obliquely from a vertical plane substantially as shown and described.

OAKLEY S. WALKER.

Witnesses:
EDNA I. TYLER,
C. W. WOOD.