No. 630,536. Patented Aug. 8, 1899.

L. S. & J. N. HEALD.

DRILL GRINDING MACHINE.

(Application filed Feb. 6, 1899.

(No Model.) 4 Sheets—Sheet 1

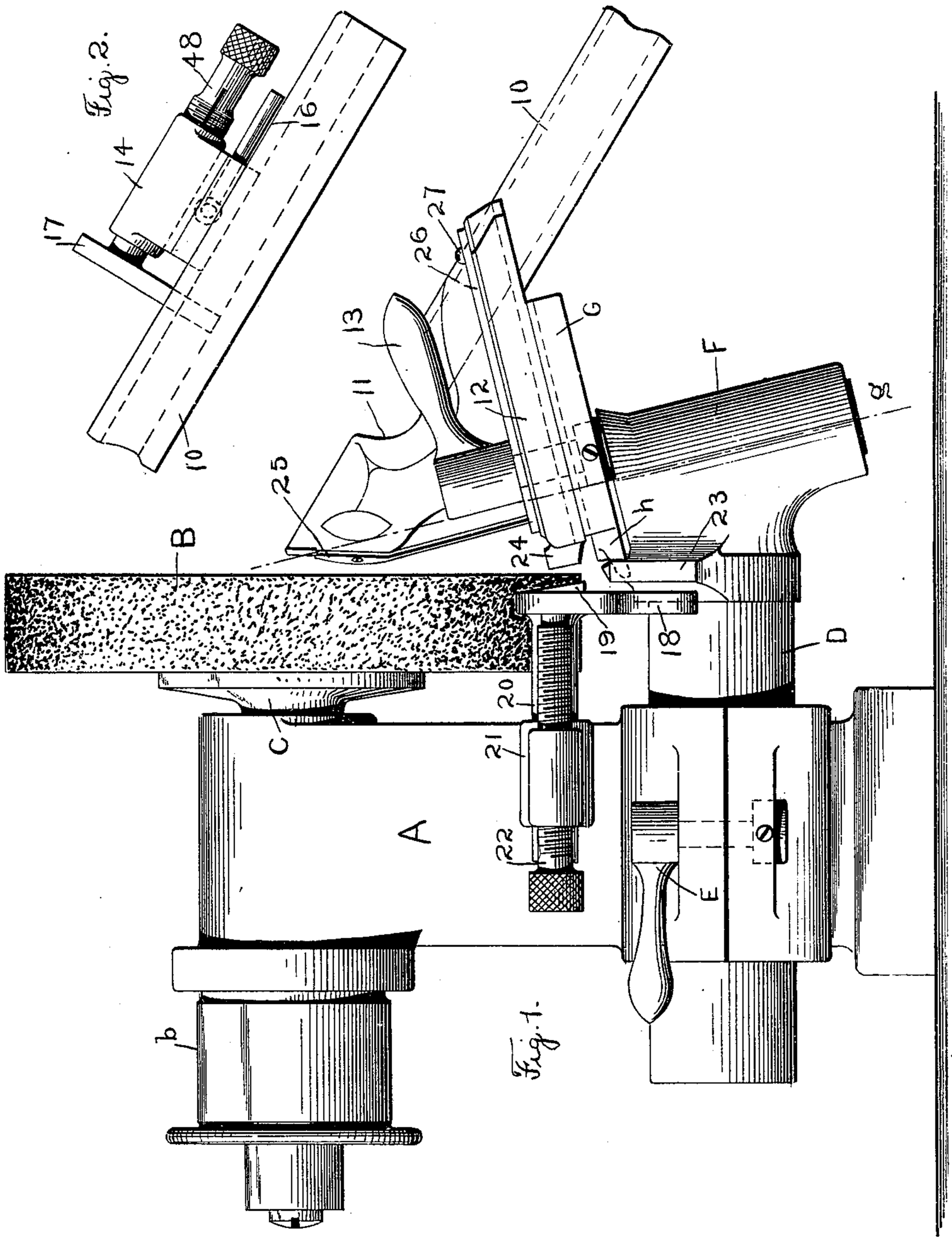

Fig. 1.

Witnesses.
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M. E. Hogan.

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(Application filed Feb. 6, 1899.)

(No Model.) 4 Sheets—Sheet 2.

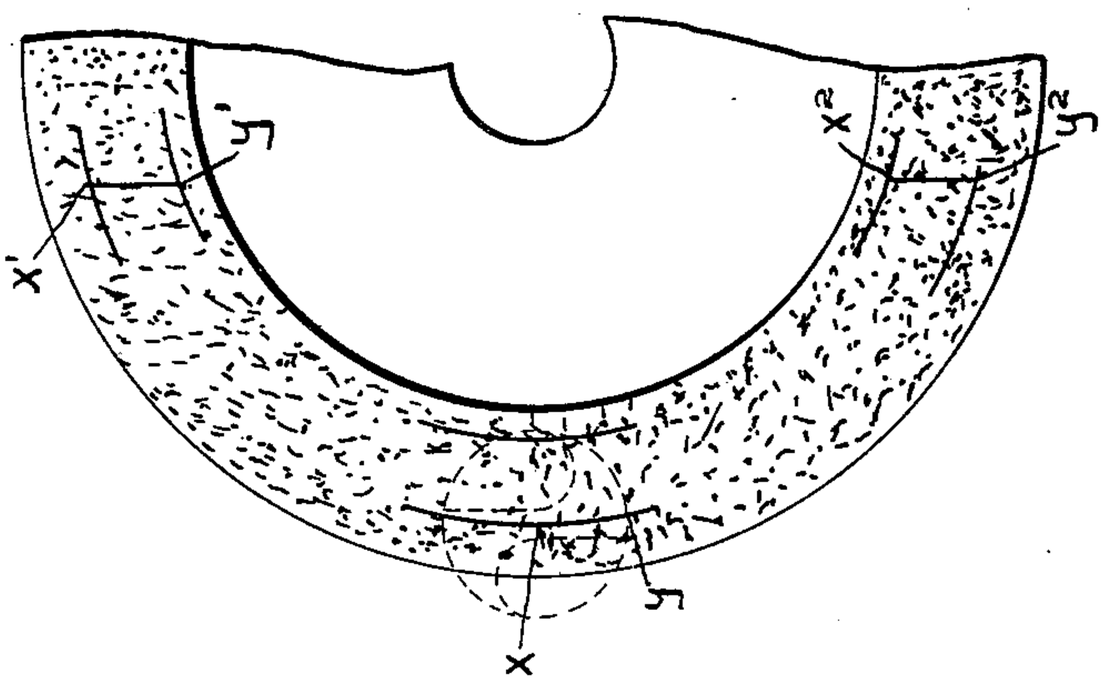

Fig. 4.

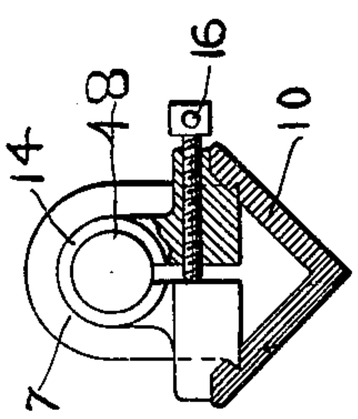

Fig. 5.

Fig. 3.

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(No Model.) 4 Sheets—Sheet 3.

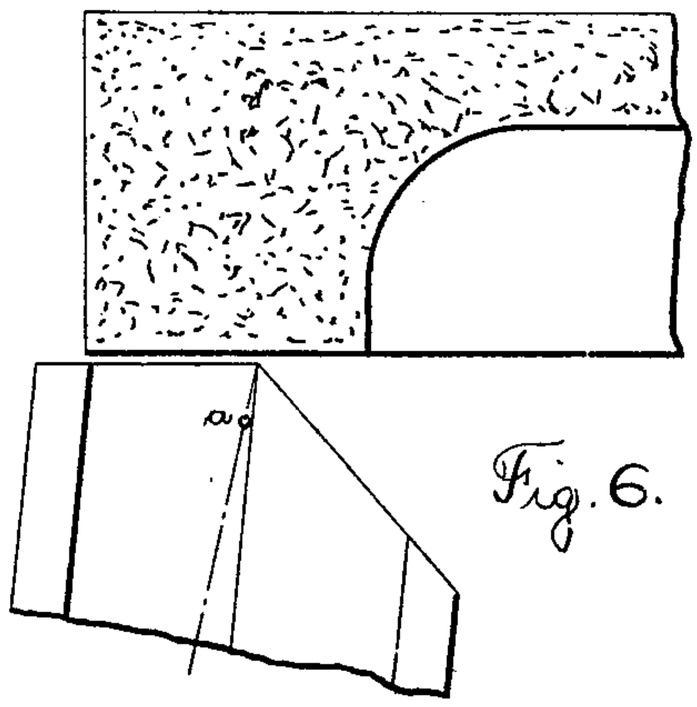

Fig. 6.

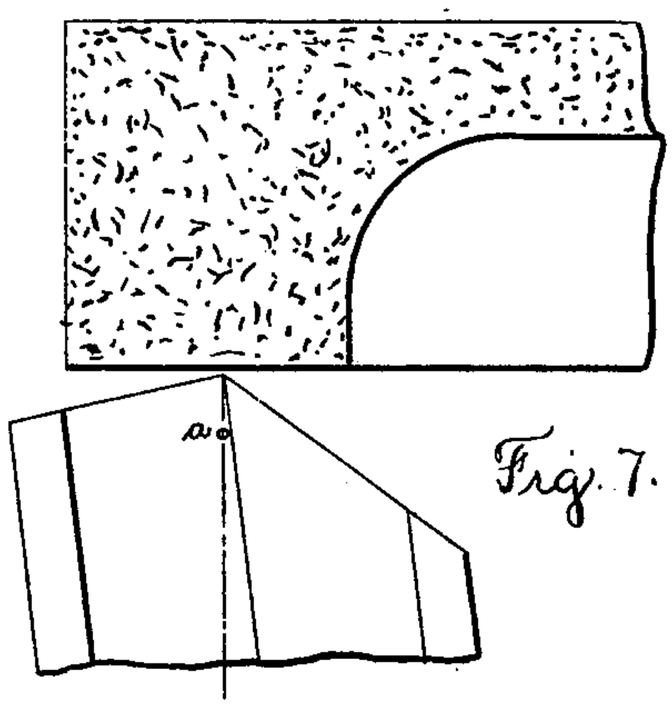

Fig. 7.

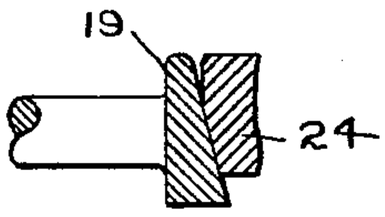

Fig. 8.

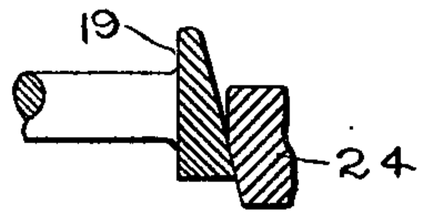

Fig. 11.

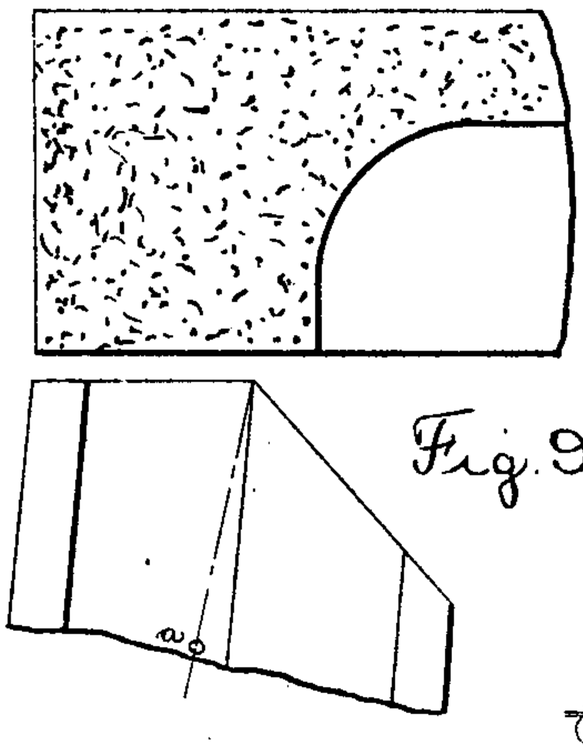

Fig. 9

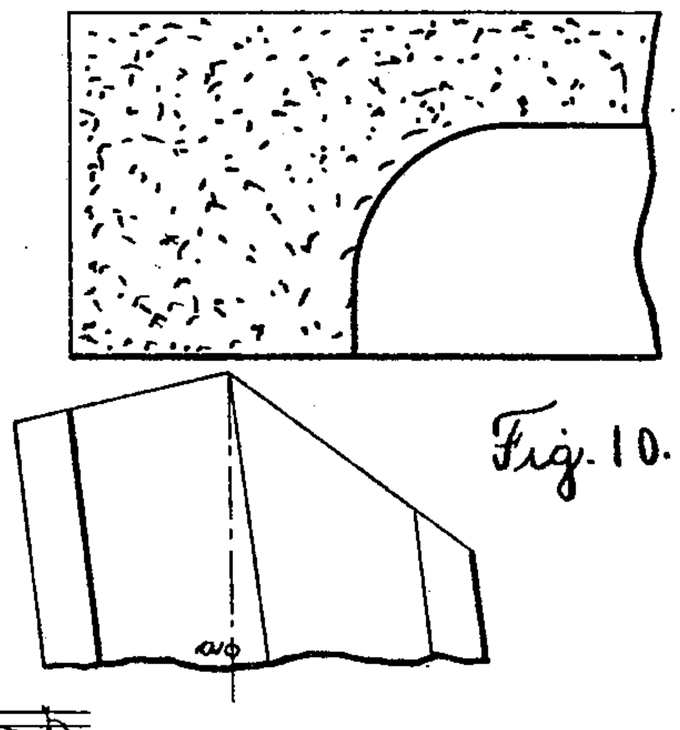

Fig. 10.

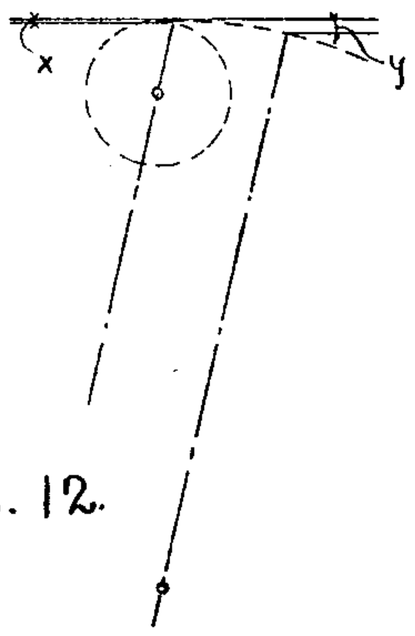

Fig. 12.

Witnesses.
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No. 630,536. Patented Aug. 8, 1899.

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DRILL GRINDING MACHINE.

(Application filed Feb. 6, 1899.)

(No Model.) 4 Sheets--Sheet 4.

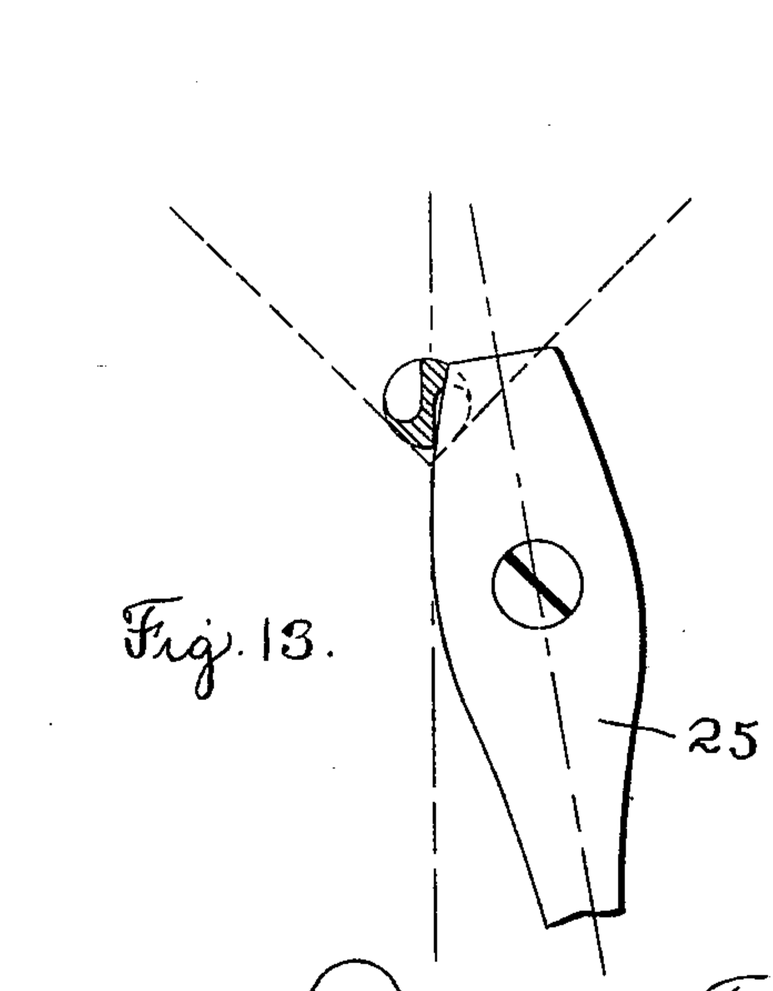

Fig. 13.

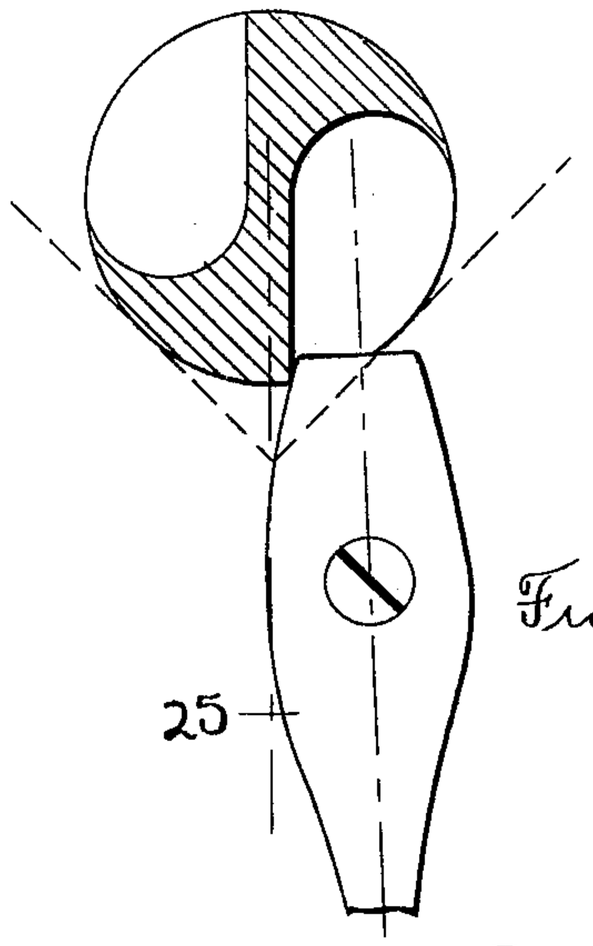

Fig. 14.

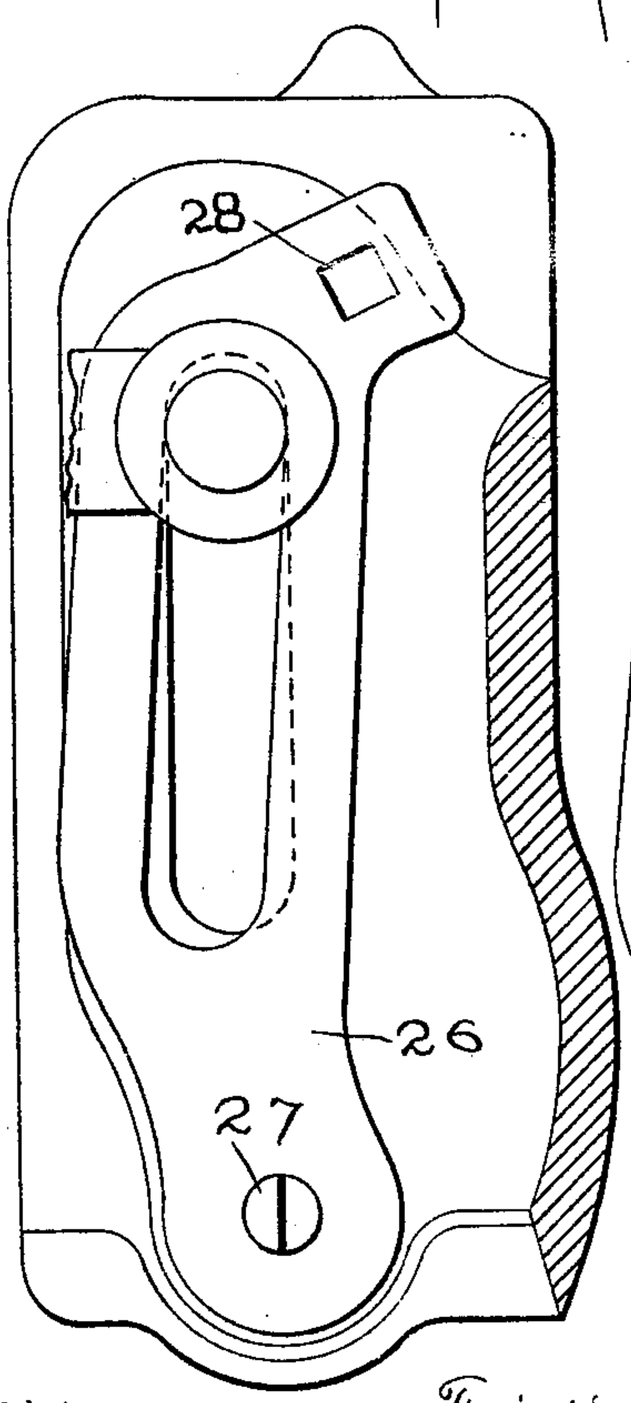

Fig. 15.

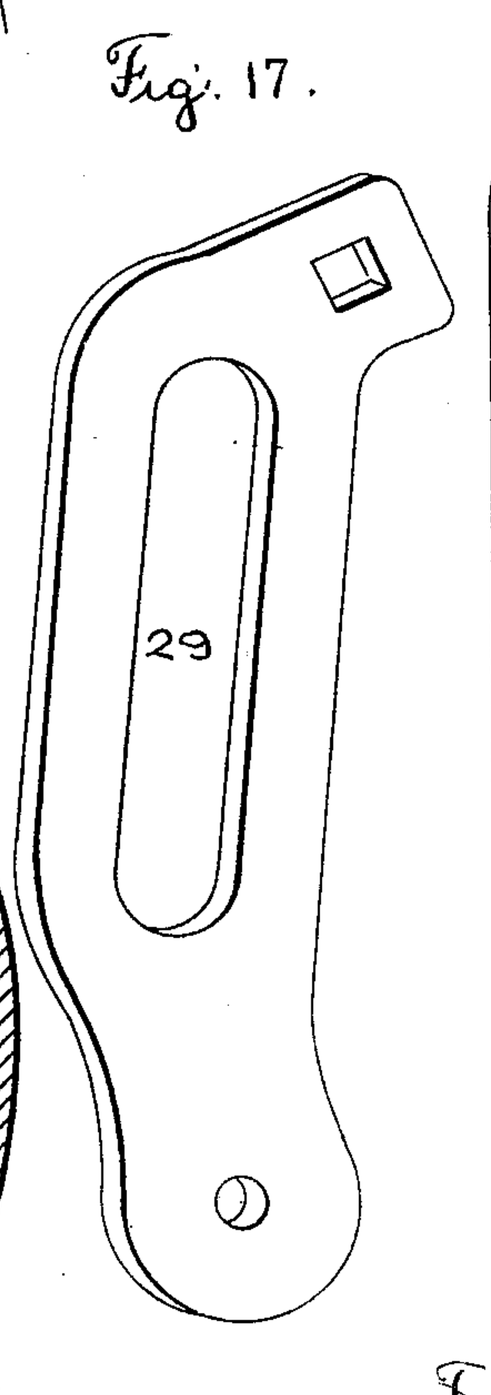

Fig. 17.

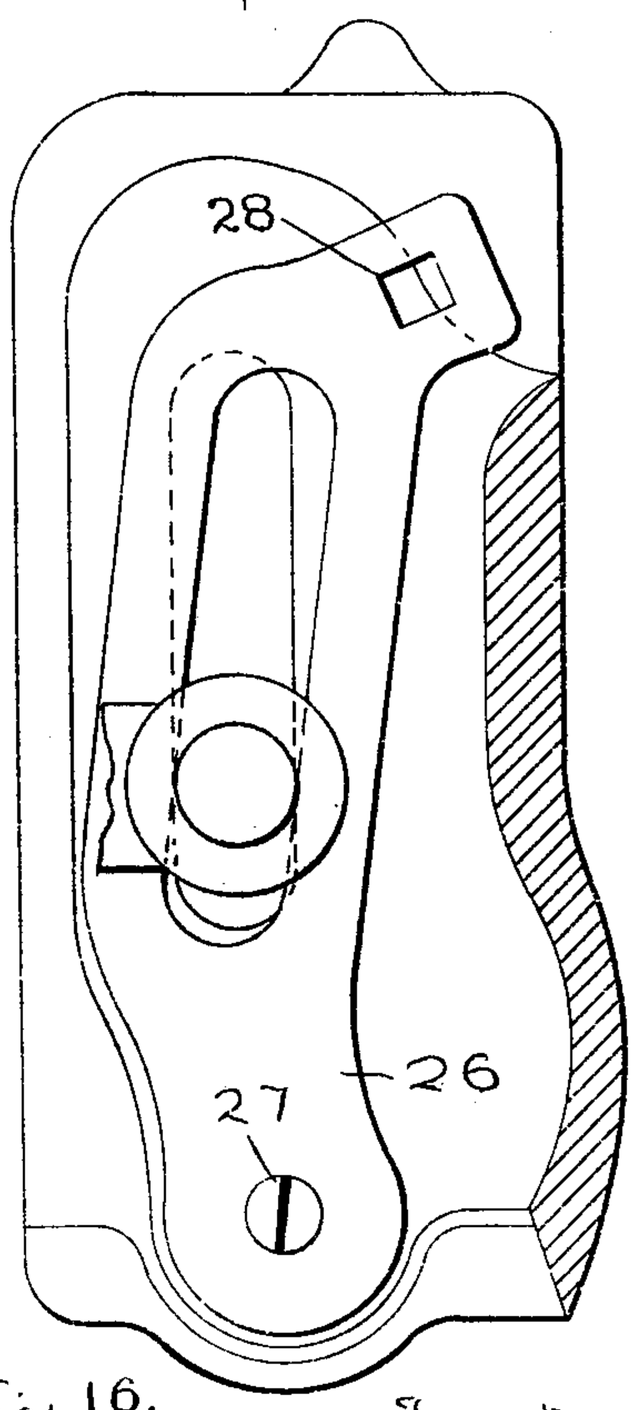

Fig. 16.

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UNITED STATES PATENT OFFICE.

LEANDER S. HEALD AND JAMES N. HEALD, OF BARRE, MASSACHUSETTS;
SAID JAMES N. HEALD ASSIGNOR TO SAID LEANDER S. HEALD.

DRILL-GRINDING MACHINE.

SPECIFICATION forming part of Letters Patent No. 630,536, dated August 8, 1899.

Application filed February 6, 1899. Serial No. 704,727. (No model.)

To all whom it may concern:

Be it known that we, LEANDER S. HEALD and JAMES N. HEALD, citizens of the United States, residing at Barre, in the county of Worcester and State of Massachusetts, have invented a new and useful Drill-Grinding Machine, of which the following is a specification.

Our invention relates to that class of drill-grinding machines in which the drill is held in an inclined drill-holder, so that its end may be presented to a flat-faced grinding-wheel by swinging the drill-holder about an axis of oscillation which is at one side of the center line of the drill, and is inclined with respect to the face of the grinding-wheel. In a machine of this class it is now customary to move the inclined drill-holder longitudinally to adjust said machine for different-sized drills. This longitudinal adjustment of an inclined drill-holder changes the elevation of the grinding-point or line of contact of the drill with the grinding-wheel, the grinding-point of a large drill being higher up on the face of the wheel than the grinding-point of a small drill. Furthermore, this variation in elevation of the grinding-points of different-sized drills is increased by using a trough or V shaped drill-holder, as a large drill will rest higher up in the V of such a holder than a small drill. To obtain the best results, it is essential that the lip of the drill should be presented to the wheel substantially at a tangent to the grinding-circle; otherwise irregularities in the face of the grinding-wheel will produce irregularities in the drill-lip.

One object of our invention is to improve the class of drill-grinding machines referred to by constructing a drill-grinding machine of this class in which the grinding-points of all drills are kept at a substantially constant elevation, presenting the lips of all drills within the capacity of the machine substantially tangentially to the grinding-circles. To accomplish this object, we provide for the adjustment of the drill-holder at right angles to its axis of oscillation, and inasmuch as this adjustment brings the nose of the drill-holder enough lower when set for grinding a large drill than when set for grinding a small drill to substantially offset the difference of position of such drills in the V of the drill-holder the grinding-points of all drills within the capacity of the machine will be kept at a substantially constant elevation, presenting the lips of such drills substantially tangentially to the grinding-circles.

A second object of our invention is to allow for differences in the thickness of the webs of different-sized drills by providing the drill-holder with a movable lip-rest which is automatically moved by the adjustment of the drill-holder on its bracket.

Further, in the present practice of adjusting a drill-grinding machine of the class to which our invention relates the sleeve or carriage supporting the drill-holder is first loosened and pulled out, the drill-holder is adjusted on its bracket so that the end of the drill-holder will have the required radius of motion about the axis of oscillation, and the sleeve or carriage is then moved back to bring the drill up to the grinding-wheel and clamped in such position that the nose of the drill-holder will have the necessary clearance from the face of the grinding-wheel.

To gage the adjustment of the drill-holder upon its bracket, it has been previously proposed to provide the drill-holder and bracket with a scale or calipering-jaws. Calipering-jaws thus located are necessarily inclined to the line of longitudinal adjustment of the drill-holder and are therefore difficult to use with accuracy.

A third object of our invention is to adjust a machine of this class by utilizing the sliding motion of the sleeve or carriage to first fix the position of the axis of oscillation with relation to the grinding-surface and then to utilize the motion of the drill-holder on its bracket simply to bring the drill up to the wheel. This enables us to use calipering-jaws on the machine-standard and sliding sleeve or carriage, respectively, which calipering-jaws have contact-faces at right angles to the line of adjustment.

Furthermore, in adjusting a machine of this class the clearance between the nose of the drill-holder and the grinding-wheel has heretofore been regulated by the eye. This has required accurate judgment on the part of the operator, as the longer radius of mo-

tion necessarily used in grinding a large drill requires that more clearance be left between the nose of the drill-holder and grinding-wheel than is required by the short radius of motion used in grinding a small drill.

A fourth object of our invention is to provide the drill-holder and machine-standard with stops for regulating the clearance between the grinding-wheel and nose of the drill-holder, these stops being preferably arranged so that a greater amount of clearance will be left when the machine is adjusted for large-sized drills than when the same is adjusted for smaller drills. These particular stops last described will act to limit or determine the position of the drill-holder, so that the necessary clearance will be provided to prevent the nose of the drill-holder striking against the face of the grinding-wheel no matter whether the nose of the drill-holder is to have the large radius of motion required for a large drill or the small radius of motion required for a small drill. The position of the drill-holder is thus automatically determined and nothing is left to the judgment or skill of the operator.

To these ends our invention consists of the parts and combinations of parts, as hereinafter described, and more particularly pointed out in the claims at the end of this specification.

In the accompanying four sheets of drawings, Figure 1 is a side view of a drill-grinding machine constructed according to our invention, the parts being shown as partially adjusted for grinding a small drill. Fig. 2 is a detail side view of the adjustable tail-stop for feeding the drill up to the grinding-wheel during the grinding operation. Fig. 3 is a partial side view of a drill-grinding machine constructed according to our invention, the parts being shown in the relative position assumed by them when the machine is adjusted to grind a large-sized drill. Fig 4 is a diagrammatic view illustrating the grinding action which results from presenting the points of drills to the face of the grinding-wheel at different elevations. Fig. 5 is a detail sectional view of the adjustable tail-stop for feeding the drill to the wheel during the grinding operation. Figs. 6 and 7 are views illustrating the motion of the nose of the drill-holder with respect to the grinding-wheel when the machine is set for a small-sized drill. Fig. 8 is a detail view showing the relative position of the clearance-stops when the machine is set for a small-sized drill. Figs. 9 and 10 are views illustrating the motion of the nose of the drill-holder with respect to the grinding-wheel when the machine is set for a large-sized drill. Fig. 11 is a detail view illustrating the relative position of the clearance-stops when the machine is set for a large-sized drill. Fig. 12 is a diagrammatic view showing the different clearances required when the drill-holder is set for different-sized drills. Figs. 13 and 14 are views illustrating different relative positions of the adjustable lip-rest. Figs. 15 and 16 are detail views illustrating different relative positions of the operating-plate employed for moving the adjustable lip-rest, and Fig. 17 is a detail perspective view of said operating-plate.

Referring to the drawings and in detail, A designates the machine-standard, and B designates the flat-faced grinding-wheel, which is secured on the end of an arbor C, which arbor C is journaled in the machine-standard and arranged to be driven from a pulley *b*.

Movably mounted in the machine-standard A is a sleeve or carriage D, which slides in a split socket and may be clamped in its adjusted position by a handle E, threaded onto the end of a clamping-bolt. The sleeve or carriage D is provided at its end with an inclined socket F, journaled in which is a stud *g*, extending down from a bracket G. The oscillation of the bracket G is limited by means of stops *h*, which are carried by the bracket G and arranged to engage a coöperating stop on the sleeve D.

The drill-holder of a drill-grinding machine constructed according to our invention preferably consists, essentially, of an inclined trough or V shaped section 10, which may be provided with finger-notches 11, which allow drills of different sizes to be readily laid in or taken up out of the drill-holder. The inclined drill-holder 10 is carried by a base-section 12, which is mounted on the bracket G and is adjustable thereon substantially at right angles to the axis of oscillation. The inclined drill-holder may be clamped in its adjusted position by a clamping-handle 13, threaded onto the end of the clamping-bolt.

By adjusting the inclined drill-holder substantially at right angles to its axis of oscillation the elevation of the grinding-points will be kept substantially constant, as before explained, thus securing a more uniform grinding than would be possible in constructions in which the elevation of the grinding-points varies at all widely with respect to the face of the grinding-wheel, as we have illustrated diagrammatically in Fig. 4. As shown in this figure the dotted circle indicates substantially the normal position of the grinding-point in a machine constructed according to our invention, and as thus located it will be seen that the lip of the drill, as indicated at *x y*, is substantially tangential to the grinding-circle, whereas if the grinding-point was elevated so that the drill-lip occupied the position indicated at x' y' or was depressed to the position indicated by x^2 y^2 the drill-lip would no longer be kept substantially tangential to the grinding-circles, as indicated by the arrows, and on this account irregularities in the face of the grinding-wheel would produce irregularities in the drill-lip, which will be avoided when the drill-lip is kept at a tangent to the grinding-circles.

The construction of the adjustable tail-

stop which we preferably employ for feeding the drills up to the grinding-wheel is most clearly shown in Figs. 2 and 5. As shown in these figures the inclined drill-holder 10 is provided on its inner surface with ways for receiving a split carriage or block 14. The carriage or block 14 may be spread apart or clamped in its adjusted position on the drill-holder by means of a clamping-screw having an operating-handle 16. The stop-plate 17 is provided with a shank fitting loosely into the block 14, and the stop-plate 17 may be adjusted by a screw 48.

The calipering-jaws which we preferably employ for setting a drill-grinding machine constructed according to our invention are most clearly illustrated in Figs. 1 and 3. As shown in these figures the adjustable calipering-jaw 18, carried by the machine-standard, is provided with a shank or guide 20, which fits into a boss 21 of the machine-standard, and the calipering-jaw 18 may be adjusted or moved back as the face of the grinding-wheel wears away by means of an adjusting-screw 22, threaded into the boss of the machine-standard and journaled at its end in the calipering-jaw 18. Coöperating with the calipering-jaw 18 of the machine-standard is a calipering-jaw 23, carried by the adjustable sleeve D. The calipering-jaws 18 and 23 have their faces of contact at right angles to the line of adjustment of the sleeve D, and therefore permit a much more ready and accurate adjustment of the machine than is possible with calipering-jaws having their surfaces of contact inclined to the line of adjustment.

Carried by the machine-standard A and preferably formed integrally with the calipering-jaw 18 is a clearance-stop 19, arranged to coöperate with a clearance-stop 24, carried by the drill-holder. The clearance-stops 19 and 24 have inclined faces of contact, so that when the machine is set for a large-sized drill a greater amount of clearance will be left between the nose of the drill-holder and the grinding-wheel than when the machine is set for a small-sized drill. The operation resulting from the coöperation of clearance-stops in this arrangement is most clearly illustrated in the third sheet of drawings.

As shown in Figs. 6, 7, and 12, the drill-holder is supposed to be set for a comparatively small drill—as, for example, when the calipering-jaws 18 and 23 are brought relatively close together, as illustrated in Fig. 1. The nose of the inclined drill-holder 10 will then have a comparatively small radius of motion, the position of its axis of oscillation being indicated at *a*. In grinding a small drill it is necessary that the nose of the drill-holder should come close up to the face of the grinding-wheel, as it is essential that the drill should be supported near its end when grinding and also because the lip-rest, hereinafter referred to, will permit a small drill to extend but a very short distance beyond the nose of the drill-holder; but inasmuch as the nose of the drill-holder has a comparatively short radius of motion when grinding a small drill it can be set close up to the grinding-wheel without liability of contact therewith, and the inclined clearance-stops 19 and 24, engaging substantially as illustrated in Fig. 8, therefore leave a relatively small clearance between the nose of the drill-holder and the face of the grinding-wheel. On the other hand, when the machine is adjusted for a comparatively large-sized drill—that is to say, when the calipering-jaws 18 and 23 are spread apart, as illustrated in Fig. 3—the nose of the drill-holder will have a comparatively long radius of motion about its axis of oscillation, as illustrated in Figs. 9, 10, and 12, and it is essential that a greater amount of clearance should be left between the nose of the drill-holder and the grinding-wheel, which is accomplished by having the clearance-stops 19 and 24 engaged substantially as shown in Fig. 11.

The use of clearance-stops in a grinding-machine constructed according to our invention we regard as a particularly important part of our invention, as the use of these stops entirely dispenses with the requirement of skill or judgment on the part of the operator—that is to say, when the calipering-jaw 18 has been once set to proper position with respect to the face of the grinding-wheel B it is then impossible for the operator to jam the nose of the drill-holder up against the face of the grinding-wheel no matter whether the machine is adjusted either for large-sized drills or for small-sized drills.

To correctly grind various-sized drills in a grinding-machine constructed according to our invention, it is essential that the drills should be set in the inclined drill-holder, so that the drill-lips will be substantially vertical, and in order to insure different-sized drills being brought to this position we preferably provide the inclined drill-holder with an adjustable lip-rest 25, the operation of said lip-rest being most clearly illustrated in the fourth sheet of drawings. As shown in Figs. 13 and 14, the movable lip-rest 25 preferably consists of a piece pivoted on a screw at the nose of the drill-holder, so that it may be thrown in to coöperate with a small drill, as shown in Fig. 13, or may be moved out to coöperate with a large drill, as shown in Fig. 14. To automatically secure this adjustment of the lip-rest 25, we preferably employ a slotted operating-plate 26, which is pivoted on a screw 27 on the base-section 12 of the drill-holder. The plate 26 is provided with a slot 29, engaging the clamping-bolt, which fastens the drill-holder in its adjusted position, as shown in Figs. 15 and 16. At its end the operating-plate 26 is provided with a socket 28 for engaging a tailpiece extending down from the movable lip-rest 25. The slot 29 in the operating-plate 26 is inclined with respect to the line of adjustment of the drill-holder, and on this account when the drill-

holder is moved in or out the operating-plate 26 will be moved and the adjustment of the drill-holder upon its bracket will automatically adjust the movable lip-rest 25.

We are aware that changes may be made by those who are skilled in the art in the construction of drill-grinding machines without departing from the scope of our invention as expressed in the claims and that certain features of our invention may be omitted, if desired, or may be applied to drill-grinding machines of different classes from that herein illustrated. We do not wish, therefore, to be limited to the construction which we have herein shown and described; but

What we do claim, and desire to secure by Letters Patent of the United States, is—

1. In a machine of the class described, the combination of a flat-faced grinding-wheel, an inclined drill-holder arranged to swing about an axis of oscillation at one side of the drill-holder and inclined with respect to the face of the grinding-wheel, and means for adjusting said inclined drill-holder substantially at right angles to its axis of oscillation, substantially as described.

2. In a drill-grinding machine, the combination of a machine-standard, a spindle journaled therein, a flat-faced grinding-wheel carried by said spindle, a sleeve or carriage adjustably connected to the machine-standard, a bracket arranged to oscillate in said sleeve or carriage about an axis inclined with respect to the face of the grinding-wheel, and an inclined drill-holder adjustable on said bracket substantially at right angles to the axis of oscillation, substantially as described.

3. In a machine of the class described, the combination of a machine-standard, a spindle journaled therein, a flat-faced grinding-wheel, and a driving-pulley secured on relatively opposite ends of said spindle, a cylindrical sleeve adjustably mounted in the machine-standard, means for clamping the sleeve in its adjusted position, a bracket mounted in the sleeve to oscillate about an axis inclined to the face of the grinding-wheel, and an inclined drill-holder, adjustable on said bracket substantially at right angles to the axis of oscillation, substantially as described.

4. In a drill-grinding machine, the combination of the machine-standard A, a spindle C journaled therein, a flat-faced grinding-wheel B and a driving-pulley secured on relatively opposite ends of said spindle, a cylindrical sleeve D adjustably mounted in a split socket in the machine-standard, means for clamping the sleeve in its adjusted position, an oscillating bracket G having a stud *g* engaging a socket F carried by the sleeve D, and an inclined continuous V-grooved drill-holder 10 mounted on said bracket and adjustable substantially at right angles to its axis of oscillation, substantially as described.

5. In a machine of the class described, the combination of a drill-holder, a movable lip-rest, and connections for automatically moving the lip-rest from the adjustment of the drill-holder, substantially as described.

6. The combination of an inclined drill-holder arranged to swing about an axis of oscillation, a movable lip-rest, connections for adjusting the drill-holder substantially at right angles to its axis of oscillation, and connections for automatically moving the lip-rest by the adjustment of the drill-holder, substantially as described.

7. The combination of a V-grooved inclined drill-holder arranged to swing about an axis of oscillation, means for adjusting the drill-holder substantially at right angles to its axis of oscillation, a movable lip-rest pivotally secured to the drill-holder, and an operating-plate arranged to move the lip-rest by the adjustment of the drill-holder, substantially as described.

8. In a machine of the class described, the combination of a V-grooved inclined drill-holder 10 arranged to swing about an axis of oscillation, means for adjusting the drill-holder on its bracket substantially at right angles to its axis of oscillation, a lip-rest 25 pivotally secured near the nose of the drill-holder, and an operating-plate 26 pivoted to the base of the drill-holder and having a slot inclined to the line of adjustment of the drill-holder, whereby when the drill-holder is adjusted with respect to its axis of oscillation, the pivoted lip-rest will be automatically moved, substantially as described.

9. In a machine of the class described, the combination of an adjustable sleeve or carriage, an inclined drill-holder journaled to oscillate in said sleeve or carriage and adjustable with respect to its axis of oscillation, and calipering-jaws carried by the sleeve or carriage and the machine-standard respectively, substantially as described.

10. In a machine of the class described, the combination of an adjustable sleeve or carriage, an inclined drill-holder journaled to oscillate in said sleeve or carriage and adjustable with respect to its axis of oscillation, and calipering-jaws carried by the machine-standard and adjustable sleeve or carriage respectively, the calipering-jaws carried by the machine-standard being adjustable to compensate for the wear of the wheel, and the contact-faces of said calipering-jaws being substantially at right angles to the line of adjustment of the sleeve or carriage, substantially as described.

11. In a machine of the class described, the combination of the machine-standard A, an adjustable sleeve or carriage D, a bracket G journaled to oscillate in said sleeve or carriage D, an inclined drill-holder 10 adjustably mounted on the bracket G, and calipering-jaws 18 and 23 carried by the machine-standard and adjustable sleeve or carriage D respectively, said parts being arranged so that the position of the axis of oscillation may first be determined by calipering the drill to be ground, and the drill may then be brought up

to the grinding-wheel by adjusting the drill-holder on its bracket, substantially as described.

12. In a machine of the class described, the combination of a flat-faced grinding-wheel, an adjustable inclined drill-holder, and stops for regulating the clearance between the nose of the drill-holder and grinding-wheel, one of said stops being adjustable to compensate for the wear of said wheel, substantially as described.

13. In a machine of the class described, the combination of a grinding-wheel, an inclined drill-holder arranged to swing about an axis of oscillation, means for adjusting the drill-holder for different-sized drills, and clearance-stops arranged to prevent the nose of the drill-holder striking against the face of the grinding-wheel, no matter whether the nose of the drill-holder is to have the large radius of motion required for a large drill or the small radius of motion required for a small drill, substantially as described.

14. In a machine of the class described, the combination of a continuous V-grooved drill-holder, and an adjustable tail-stop comprising a block slotted longitudinally, so that the same can be expanded or contracted into engagement with ways in said V-grooved drill-holder, a stop-plate fitting into said block, and a screw for adjusting said stop-plate, substantially as described.

15. In a machine of the class described, the combination of an adjustable sleeve or carriage, a bracket journaled to oscillate in said sleeve or carriage, an inclined drill-holder adjustable substantially at right angles to the axis of oscillation, a calipering-jaw carried by the sleeve, a clearance-stop carried by the drill-holder, and a combined calipering-jaw and clearance-stop adjustably mounted on the standard of the machine in position to coöperate with the calipering-jaw of the sleeve and the clearance-stop of the drill-holder, substantially as described.

16. In a machine of the class described, the combination of the machine-standard A, a cylindrical sleeve D adjustably mounted therein, a bracket G journaled to oscillate in said sleeve, an inclined drill-holder adjustable substantially at right angles to the axis of oscillation, a calipering-jaw 23 carried by the sleeve, a clearance-stop 24 carried by the drill-holder, a combined calipering-jaw and clearance-stop arranged to coöperate with the calipering-jaw 23 and clearance-stop 24, and a screw 22 for adjusting the combined calipering-jaw and clearance-stop to compensate for the wear of the grinding-wheel, said clearance-stops having inclined engaging faces so as to leave greater clearance when the machine is set for large-sized drills than when set for small-sized drills, substantially as described.

In testimony whereof we have hereunto set our hands in the presence of two subscribing witnesses.

LEANDER S. HEALD.
JAMES N. HEALD.

Witnesses:
JAMES W. CARRUTH,
JOHN C. BARTHOLOMEW.