

W. J. RENNIE.
 UNIVERSAL TOOL GRINDING MACHINE.
 APPLICATION FILED JAN. 5, 1918.

1,326,423.

Patented Dec. 30, 1919.

2 SHEETS—SHEET 1.

Fig. 9.

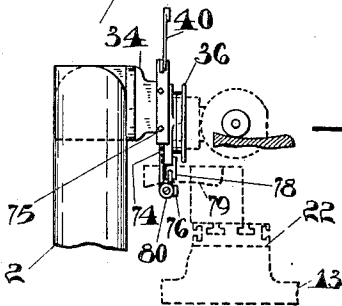


Fig. 3.

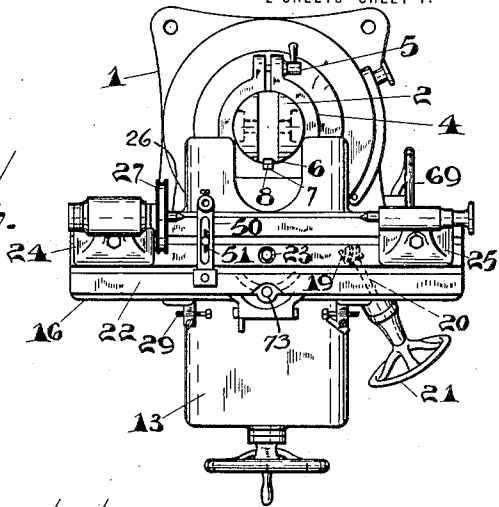


Fig. 1.

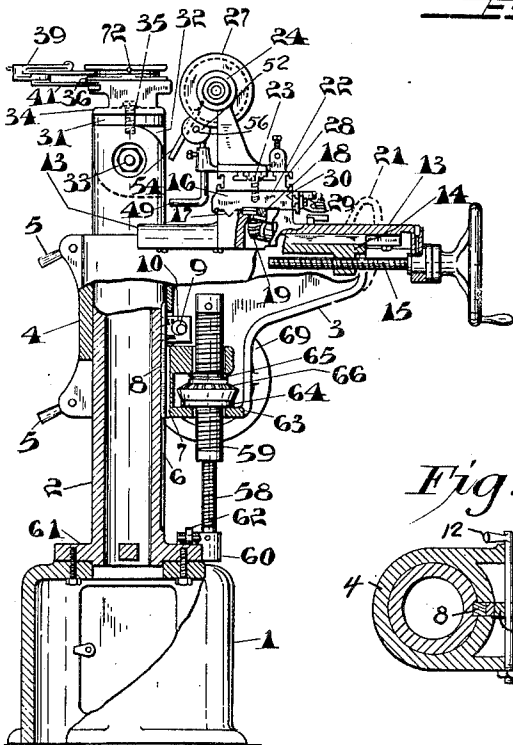


Fig. 2.

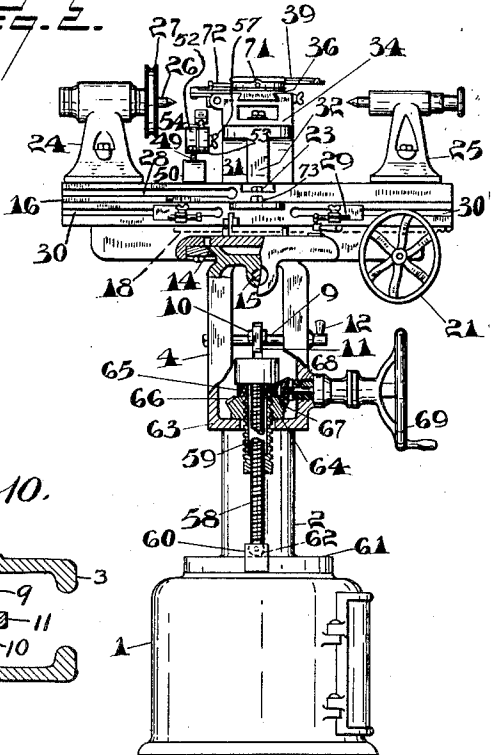
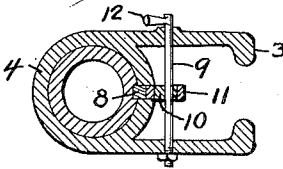


Fig. 10.



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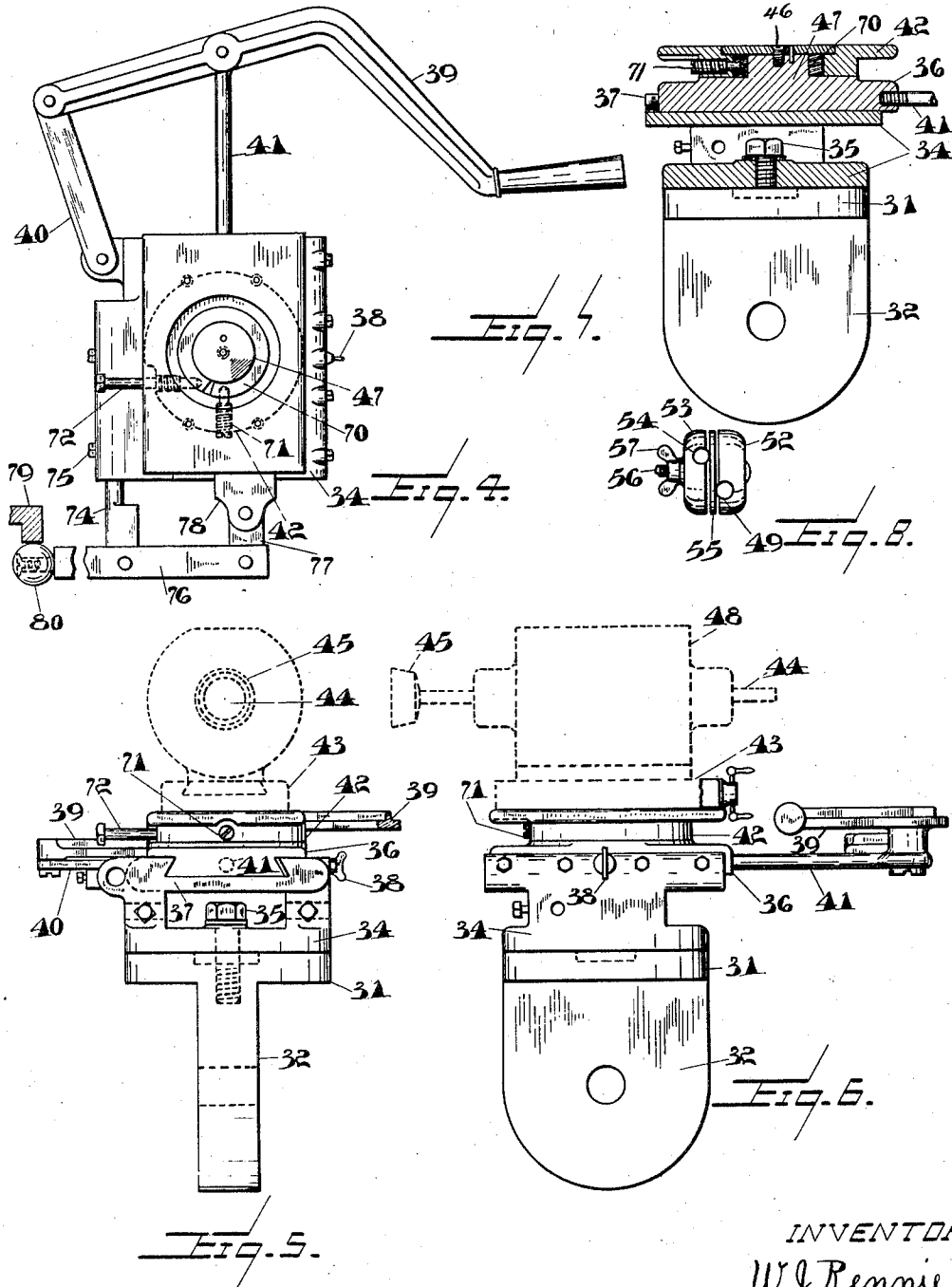
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2 SHEETS—SHEET 2.



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UNITED STATES PATENT OFFICE.

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UNIVERSAL TOOL-GRINDING MACHINE.

1,326,423.

Specification of Letters Patent.

Patented Dec. 30, 1919.

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To all whom it may concern:

Be it known that I, WILLIAM J. RENNIE, of the city of Toronto, in the county of York, Province of Ontario, Canada, a subject of the King of Great Britain, have invented certain new and useful Improvements in Universal Tool-Grinding Machines, of which the following is a specification.

This invention relates to machines particularly intended for grinding milling cutters, lathe tools, drills and other machine shop tools, and my object is to devise a machine which is adapted for the grinding of the largest possible range of tools without the use of special attachments which require to be connected to and disconnected from the machine. More particularly my object is to improve the machine shown and described in Canadian Patent No. 176,772 dated May 1, 1917, which attained in some measure the desired objects, but is not adapted to as wide a range of work as is desirable, nor is as convenient in operation.

The improvements in construction referred to are hereinafter particularly described and illustrated in the accompanying drawings in which—

Figure 1 is a side elevation, partly in section, of my improved grinder;

Fig. 2 a front elevation of the same partly in section;

Fig. 3 a plan view of the same;

Fig. 4 a detail showing in plan the improved clamp for the motor base;

Fig. 5 a detail in front elevation of the same;

Fig. 6 a side elevation of the same;

Fig. 7 a sectional view of the clamp as shown in Fig. 6;

Fig. 8 a detail in plan of the tool clamping device; and

Fig. 9 a detail in side elevation of parts of the apparatus showing the use of a form for guiding the movements of the grinding tool.

Fig. 10 is a cross sectional detail illustrating the key for preventing rotary movement of the table-carrying knee and also the mechanism for operating the same.

In the drawings like numerals of reference indicate corresponding parts in the different figures.

1 is the base on which is supported the standard 2. On this standard slides the table carrying knee 3. The sleeve 4 of this

knee is partly split as shown and is provided with the clamping screws 5 by means of which it may be clamped to the standard at any height and at any desired horizontal angle.

In certain operations it is important that the table of the machine and the parts carried thereon be moved vertically in a given position with the greatest accuracy. I therefore provide the following arrangement for the accomplishment of this result. The keyway 6 is formed in the standard and a groove 7 in the knee 3. In this groove is carried a feather key 8 adapted to be received wholly within the groove or projected to lie partly in the keyway and partly in the groove. To protect and retract this key I provide a spindle 9 journaled in the knee and carrying an eccentric 10, the eccentric strap 11 being secured to the back of the key 8, the handle 12 provides means for rocking the spindle. It is evident that by rocking the spindle, the key may be forced into the keyway or retracted as may be desired. When the key is in the keyway, vertical movement is possible only in a given vertical line, no rotary movement of the knee being possible. When it is desired to rotate the knee, the feather key is withdrawn and the clamps 5 depended on to hold the knee in any desired position of vertical or rotary adjustment.

The knee is raised and lowered by means of a telescopic screw, which comprises the inner screw 58, which is threaded into the outer screw 59. The lower end of the inner screw is connected to the shoe 60 which rests on the circular flange 61 formed at the foot of the standard 2. This shoe fits over the edge of the flange and is provided with the anti-friction roller 62. The shoe will thus not rotate, but is movable in a circular path around the standard. The outer screw 59 passes through the jaws 63 formed on the knee 3 and a nut 64 located between the jaws is threaded thereon. Preferably a ball bearing 65 is placed between the nut and the upper jaw to take the upward thrust.

On the nut 64 is formed a bevel gear 66 with which meshes the bevel pinion 67 fast on the spindle 68, journaled in suitable bearings on the knee, and provided at its outer end with the hand wheel 69. The general construction and arrangement of such telescopic screws is well known in the art

and need not be hereinafter more specifically described. Suffice it to say that a much greater range of vertical movement is possible than with the use of a single screw.

The knee carries the table 13, which is movable on the guides 14 to and from the standard 2. An adjusting screw 15 of ordinary construction engaging both the table and the knee provides means for effecting the adjustment.

16 is a slide transversely movable of the table on the guides 17. The under side of this slide is provided with a rack 18 with which meshes the skew gear 19 screwed to a spindle 20 journaled in the table and provided with the hand wheel 21. Adjustable screw stops 29 of ordinary construction are provided for limiting the travel of the slide, these stops being secured in position by means of undercut slots 30 formed in the forward edge of the table, such constructions being common in the art.

On the slide is pivoted the bed 22, the pivot being formed by the screw 23. The bed may thus be rotarily adjusted in a horizontal plane. A graduated scale and vernier as shown in the plan view is preferably provided for convenience in adjustment. The bed is clamped by means of a screw 73 passing through an arc-shaped slot in the bed and threaded into the slide. This bed 22 carries tool-holding means. I show for this purpose the head stock 24 and tail stock 25, one or both of which are adjusted lengthwise of the bed in a manner common in lathe construction. The head stock is provided with a rotating center 26 driven by the pulley 27. In practice this pulley will be driven by an electric motor (not shown) which is secured to the edge of the bed, which is provided with a suitable undercut slot 28 for that purpose.

The grinding tool is supported on the head of the standard 2 in the following manner. A rocking head 31 is pivoted horizontally at the upper end of the standard, which is split to receive the hinge knuckle 32 formed on the under side of the head. A clamping bolt 33 forms the pivot. After the head has been adjusted to the desired angle, it will be clamped in position by tightening up the nut of the clamping bolt. On the rocking head a carriage 34 is pivoted to turn on an axis at right angles to the axis of the said head. The pivot is formed by a screw 35 which may be tightened up to hold the carriage in any position to which it may be turned. A slide 36 supported on the carriage is adapted to move on the guides 37 in a plane to which the axis of the carriage is substantially perpendicular. The slide may be clamped when desired by means of the set screw 38 threaded through one of the guides and en-

gaging the side of the slide. The slide is moved by means of the bent handle 39, one end of which is pivoted to the link 40 pivoted at its other end on the frame of the machine. Intermediate its ends the lever is pivotally connected with the stem 41 connected to the slide.

On the slide is supported the base 42 of the frame 43, on which is journaled the spindle 44 of the grinding tool 45. The base 42 is adapted to rotate on the carriage, the screw 46 forming the pivot. It will be noted that the slide 36 has a cylindrical boss 47 fitted in a cylindrical recess in the base 42 of greater diameter, so that a split ring 70 may be fitted in the annular recess so formed between the outer wall of the boss and the inner wall of the recess. One end of this split ring is anchored by the screw 71. The other end is engaged by the inner end of the screw 72 threaded through the base. By tightening this screw the split ring may be contracted to bind on the boss 47 and thus clamp the base 42 with the axis of the grinding tool at any desired angle to the direction of travel of the carriage 34.

In practice an electric motor 48, shown only in outline, is directly connected to the spindle 44 and forms the driving means therefor.

In connection with the grinder I employ a tooth rest and tooth rest clamp as illustrated more particularly in detail in Fig. 8. A stem 49 is fitted into a socket on a bracket 50 secured to the bed 22. This bracket is preferably slotted and is secured in position by the clamping screw 51. The stem 49 may thus be set in any desired position relative to the line of centers of the head and tail stocks.

52 is a disk having a hole formed therein parallel to one face for the passage of the said stem and opening partly through said face. A second disk 53 has a hole formed therein parallel to the face adjacent the first mentioned disk and opening partly through said face, said hole being adapted for the passage of the stem 54 of the tooth rest. It will be seen that both the stem 49 and stem 54 will project slightly through the adjacent faces of the disks 52 and 53. Between the disks is located a third disk 55, the opposite faces of which are milled or otherwise roughened. A bolt 56 passes through all three disks and has a wing nut 57 threaded on its end. It is evident that by screwing up the nut that the disks will be clamped tightly together to securely clamp the stems 49 and 54. When the nut is loosened the end of the tooth rest may be brought to any desired position and rigidly held there by tightening up said wing nut.

The tooth rest is required to engage the teeth of a milling cutter when the latter is held between the centers of the head and tail

stocks to be operated on by the grinding tool 45.

It is admitted that the arrangement of the table, slide, bed and tool-holding means is not broadly new, nor the provision of a rocking head to carry the support of a grinding tool, yet it is, as far as the applicant is aware, new to support the grinding tool to slide freely to and from the tool-holding device and to provide the rotary adjustment for the base 42 on which the grinding tool is supported. By so arranging the device I am able to bring the grinding tool and work into coöperative relationship from so many angles and in so many different ways that special attachments are practically entirely dispensed with. It is of special importance that not only the grinding tool be moved to and from the work, but also the angle of its axis of rotation to the line of travel varied as may be desired.

For some classes of work it is desirable that the movements of the slide 36 be automatically controlled to move the tool relative to the work. Means for this purpose are illustrated more particularly in Figs. 4 and 9. A fulcrum member 74 is provided with a stem which may be clamped by set screws 75 in a hole formed in the carriage 34 adjacent the slide. A lever 76 of the first order is suitably fulcrumed on the member 74. One end of this lever is connected by means of the pivoted link 77 with a lug 78 secured to the slide 36. The other end of the lever is adapted to engage a form 79 which in practice is secured to some suitable part moving with the work. When this part of the device is in use the carriage 34 will usually be so set that the slide tends to move under the influence of gravity, so that the form engaging the end of the lever tends to move up. The form therefore engages the upper side of the lever end. Preferably a ball 80 is journaled on the lever end, as a proper engagement with the form is thus secured no matter to what extent the lever be rocked. The form as shown is secured to the bed 22, which carries the tool-holding means. If this bed be moved to and from the slide 36, the form will move to and fro over the ball 80, thus causing the slide to move up and down in correspondence with the curve of the former. Any work carried by the bed may thus be ground readily to the curve of the form.

What I claim as my invention is:—

1. In a tool grinding machine, the combination of a suitably supported bed; work holding means carried thereby; a head supported to rock on a horizontal axis; a carriage rotarily adjustable on the head on an axis at right angles to the axis of said head; a slide suitably guided on said carriage to freely move rectilinearly in a plane to which the axis of the carriage is sub-

stantially perpendicular; means for reciprocating the slide; and a grinding tool rotatably supported on said slide.

2. In a tool grinding machine, the combination of a suitably supported bed; work holding means carried thereby; a head supported to rock on a horizontal axis; a carriage rotarily adjustable on the head on an axis at right angles to the axis of said head; a slide suitably guided on said carriage to freely move rectilinearly in a plane to which the axis of the carriage is substantially perpendicular; means for reciprocating the slide; and a grinding tool rotatably supported on said slide with its axis in a plane substantially parallel to the plane in which the carriage moves.

3. In a tool grinding machine, the combination of a suitably supported bed; work holding means carried thereby; a head supported to rock on a horizontal axis; a carriage rotarily adjustable on the head on an axis at right angles to the axis of said head; a slide suitably guided on said carriage to freely move rectilinearly in a plane to which the axis of the carriage is substantially perpendicular; means for reciprocating the slide; a grinding tool base rotarily adjustable on the slide on an axis substantially parallel to the axis of the carriage; and a grinding tool rotatably supported on said base.

4. In a tool grinding machine, the combination of a standard having a longitudinal keyway formed therein; a table carrying knee vertically and rotarily movable on said standard and provided with a groove adapted to be brought into coöperative relationship to the keyway; a feather key normally contained in said groove but adapted to be projected to lie partly in the keyway and partly in the groove; and means carried by the knee for projecting and retracting said key.

5. In a tool grinding machine, a tooth rest clamp comprising a suitably supported stem; a disk having a hole formed therein parallel to one face for the passage of said stem and opening partly through said face; a second disk having a hole formed therein parallel to the face adjacent the first mentioned disk and opening partly through said face; said hole being adapted for the passage of a tooth rest stem; an intermediate disk between the two aforesaid disks, having roughened faces; and a clamping bolt and nut by means of which the three disks may be drawn together to clamp the stems aforesaid.

6. In a tool grinding machine, the combination of a cylindrical standard; a base therefor having a cylindrical rim; a table carrying knee vertically and rotarily movable on said standard; a telescopic screw for raising and lowering the knee suitably con-

connected with the knee; a shoe to which the lower member of the telescopic screw is connected, said shoe fitting over the rim of the base aforesaid so that it cannot rotate but is
5 free to move around the periphery of the rim.

7. In a tool grinding machine, the combination of a suitably supported bed; work holding means carried thereby; a carriage;
10 a slide suitably guided on said carriage to freely move rectilinearly thereon; means for reciprocating the slide; a grinding tool rotatably supported on said slide; a universal joint support for the carriage; and
15 means for clamping the said universal joint.

8. In a tool grinding machine, the combination of a suitably supported bed; work holding means carried thereby; a carriage;
20 a slide suitably guided on said carriage to freely move rectilinearly thereon; means

for reciprocating the slide; a grinding tool base rotarily adjustable on the slide on an axis normal to the plane in which the slide moves; a grinding tool rotatably supported on said base; a universal joint support 25 for the carriage; and means for clamping the said universal joint.

9. In a tool grinding machine, the combination of a suitably supported vertically and horizontally movable bed; work holding means carried thereby; a form carried 30 thereby; a carriage adjacent said bed; a slide suitably guided on said carriage; a grinding tool rotatably supported on said slide; and a lever fulcrumed on the carriage adapted at one end to engage the form 35 and at the other to move the slide.

Signed at Toronto this 11th day of Dec.,
A. D. 1917.

WILLIAM JAS. RENNIE.