D. A. WALLACE.

DRILL GRINDING MACHINE.

APPLICATION FILED OCT. 5, 1920.

1,417,364.

Patented May 23, 1922.

3 SHEETS—SHEET 1.

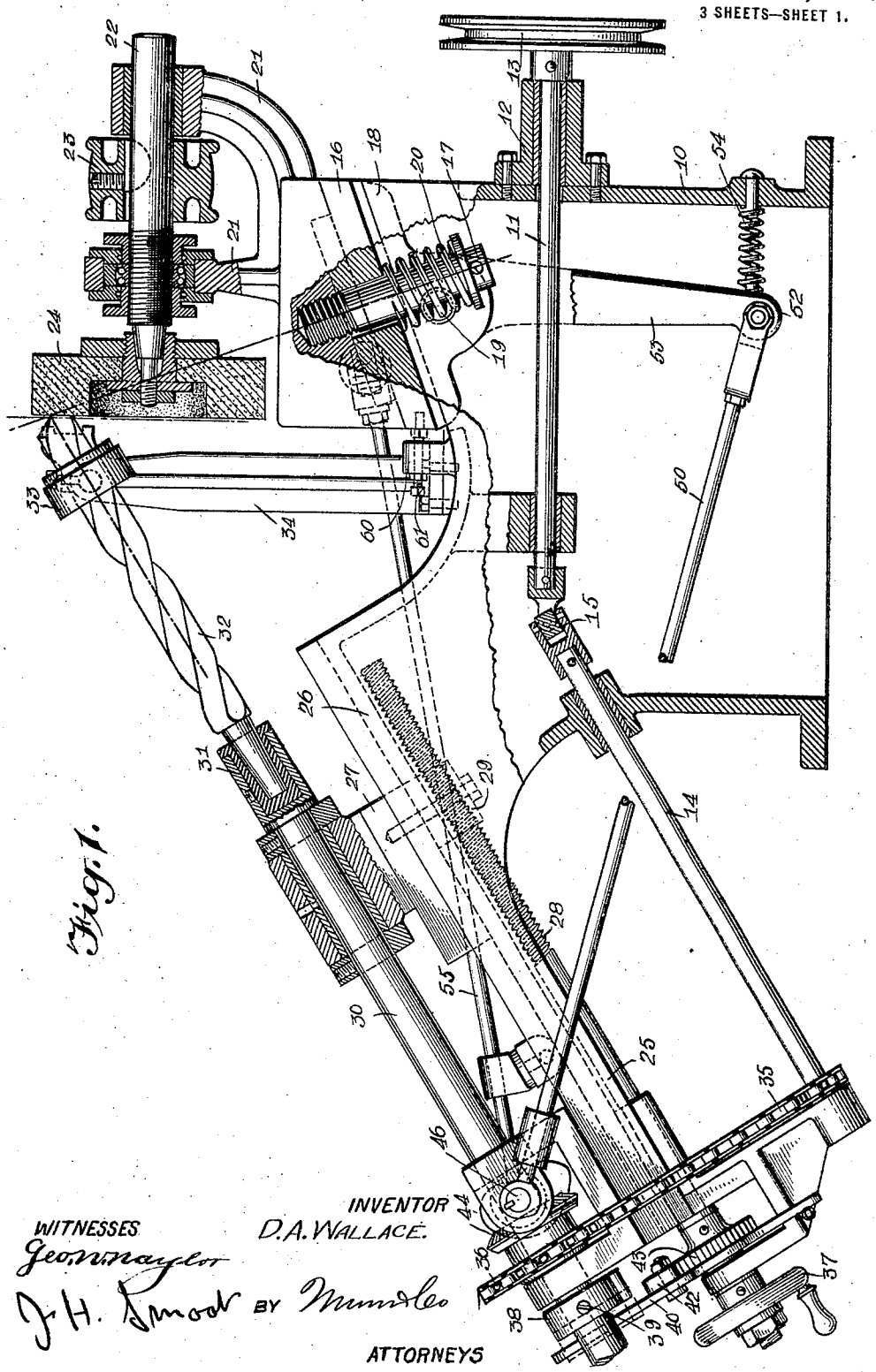


Fig. 1.

WITNESSES

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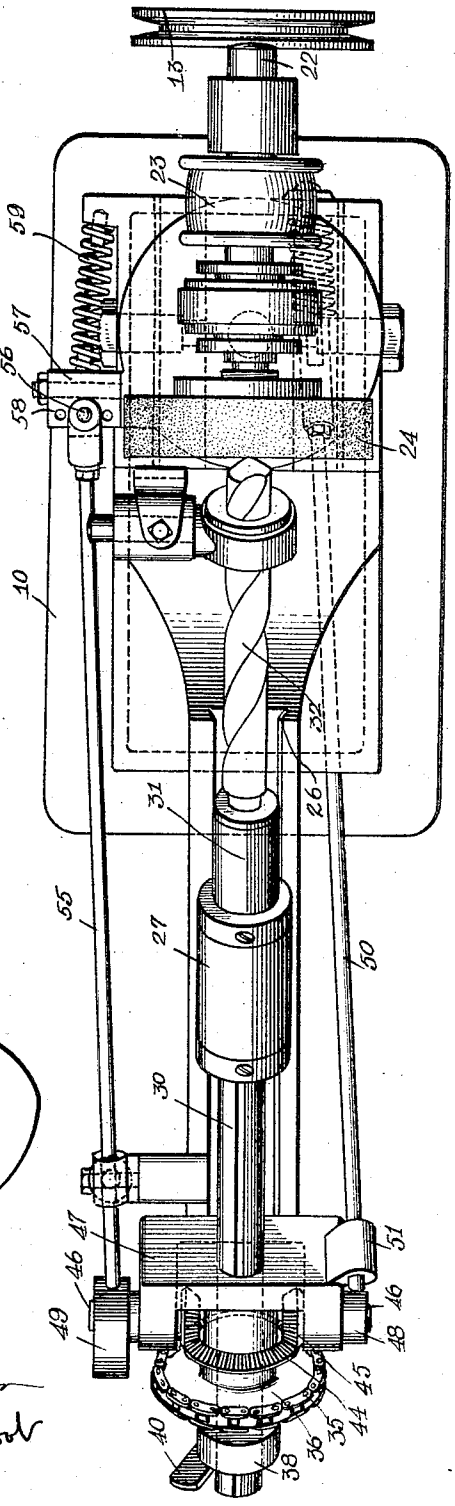


Fig. 2.

Fig. 3.

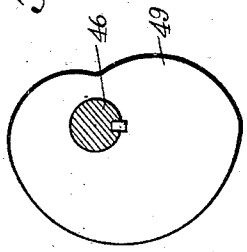
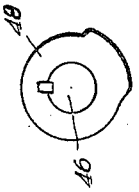


Fig. 4.



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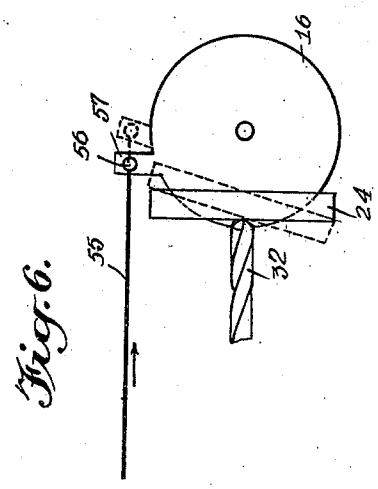


Fig. 6.

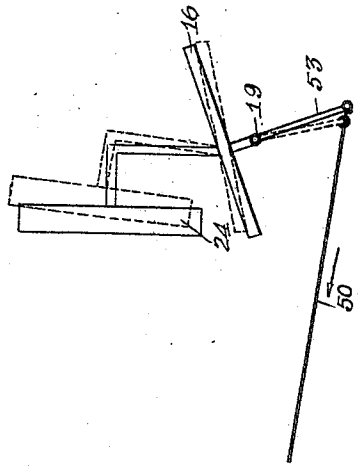


Fig. 7.

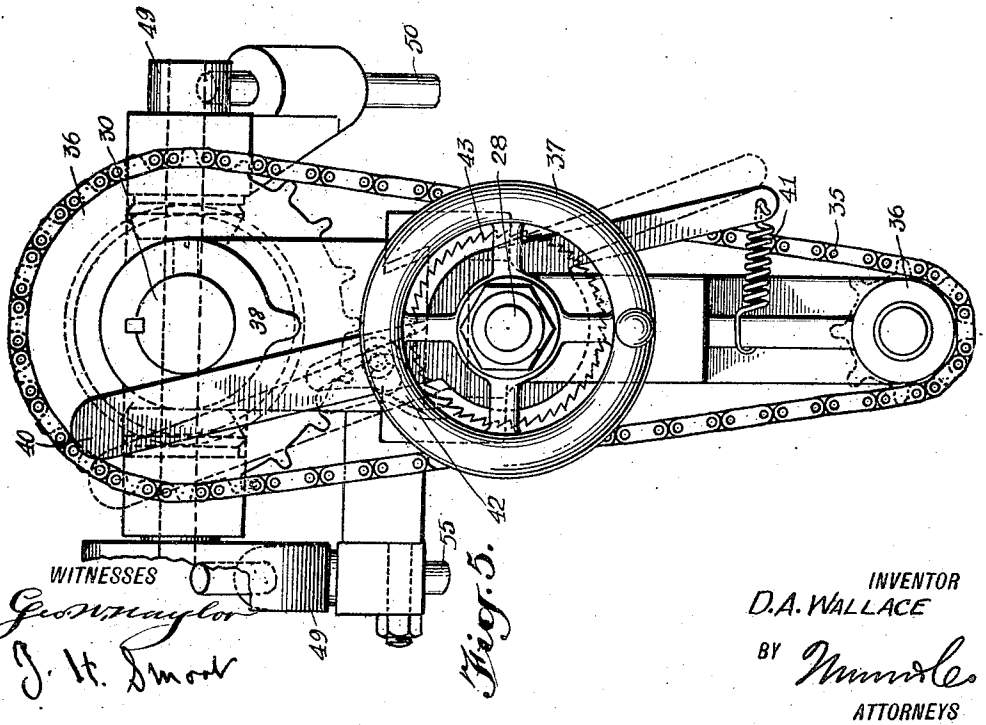


Fig. 5.

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UNITED STATES PATENT OFFICE.

DAVID ALDON WALLACE, OF WATERLOO, IOWA.

DRILL-GRINDING MACHINE.

1,417,364. Specification of Letters Patent. Patented May 23, 1922.

Application filed October 5, 1920. Serial No. 414,749.

To all whom it may concern:

Be it known that I, DAVID A. WALLACE, a citizen of the United States, and resident of Waterloo, in the county of Black Hawk and State of Iowa, have invented a new and Improved Drill-Grinding Machine, of which the following is a full, clear, and exact description.

My invention relates to grinding machines, and more particularly to a machine of this type adapted to sharpen the point of a drill for the purposes of re-sharpening the same.

In connection with the point grinding of drills, it is well appreciated that next to the drill being properly made and tempered, it is of the utmost importance that its cutting edges should be properly ground to derive the maximum of benefit from the same. In other words, both cutting edges must first have the same inclination to the axis of the drill, and second, each of these cutting edges or lips must be exactly the same length, which will of course, bring the center of the cutting edges or apex of the drill in the true center of the drill, resulting in the production of a round, smooth drilling.

In grinding machines, heretofore constructed, for this purpose it has been extremely difficult to obtain both of these requirements, resulting in objectionable work; thus if the point be central, but the angles of the cutting edges unequal, the drill will bind the side of the hole opposite that side of the point which is cutting, too large a hole will be drilled, and aside from this, all of the work will fall on the one cutting edge.

Where a drill is ground with its lips all equal angles, but with the cutting edges of different lengths the hole drilled will be too large, and when both angle and length of cutting edge are improper, the drill will labor under a most severe strain, and the support which the drill should receive from the metal on which it is operating, will be seriously impaired.

Having the defects of a conventional grinding machine in mind, I have now constructed a device of this character, more particularly adapted for use in connection with the sharpening of drill points, and by means of which I provide a grinding machine which shall sharpen a multi-lipped drill in such a manner that the angle of both lips or cutting edges will be equal.

A further object of my invention is the construction of a drill in which the length of both of the lips or cutting edges will be equal.

A still further object of my invention is the provision of a device of this nature, by means of which a lip or cutting edge will be formed which shall be perfect and entirely free from all criticism, as regards to perfectness, and which shall further gradually follow the curve of the "backing" of the drill point.

Further objects of my invention will appear in the appended drawings, in which—

Figure 1 is a partly sectional side view of a grinding machine constructed in accordance with my invention.

Figure 2 is a plane view of the grinding machine.

Figures 3 and 4 illustrate details of the device as shown in Figures 1 and 2.

Figure 5 is a rear end view of the grinding machine, and

Figures 6 and 7 show diagrammatically certain of the functions of the device.

Contrary to the conventional construction of grinding machines, and more particularly grinding machines of this type, I aim to accomplish the objects of my invention by providing a suitable medium, in which the drill will be held, guided, and fed for a distance sufficient to accomplish the desired sharpening.

I further provide a grinding medium which shall contact with the drill in such a manner as to sharpen the biting end of the same in such a way that all of the defects incident to sharpening heretofore mentioned will be eliminated.

Referring now more particularly to Figures 1 and 2, it will be seen that my grinding machine conveniently includes a base 10, supporting a shaft 11, for which suitable bearings 12 are provided. This shaft, as will be noted, is provided with a driving pulley 13 of any suitable type, and transmits rotational force to a shaft, such as 14, by means of any suitable type of universal coupling 15, for a purpose hereinafter more fully specified.

It is now to be noted, that the upper face of the base table 18 is conveniently inclined, as has been clearly indicated in Figure 1, and a table 16 of any desired type is rotatably retained upon this inclined face, by any

suitable means, such as a pivot pin 17 firmly secured to a base table 18, rockingly mounted by means of a pin 19 upon the base 10.

Thus the table 16, is capable of a turning action by virtue of the pin 17, and rocking connection permitted by the pin 19 which forms the mounting for the base table 18, carrying the table 16. In this connection it is to be noted that a suitable compression spring 20 may conveniently be utilized to properly cushion and support the table 16, such spring extending between the lower face of the latter and the end of the pin 17.

Standards 21 of any desirable character are attached to the table 16, and serve to rotatably support the shaft 22, capable of connection with the driving element by any suitable means such as a pulley 23, and carrying a grinding element 24 upon its inner end. The shaft 22 is conveniently provided with any suitable means such as has been shown, to permit of the longitudinal adjustment of the same to compensate for the wear of the grinding element 24, and the adjustment necessary to obtain proper form of drill point.

A sub-base or other suitable supporting medium, 25 conveniently extends in angular relationship with respect to the base 10, and this portion of the machine is provided with a guide-way 26 in which a traveler 27 is movably supported. Any suitable means for moving the traveler 27 longitudinal of the sub-base 25 may be utilized, such as a screw threaded rod 28 engaging a screw threaded opening in an extended portion 29 of the traveler 27, whereby upon the rod 28 being rotated, the traveler 27 will be caused to move in the guide way 26. A shaft 30 has one of its ends rotatably mounted in the traveler 27 and terminates at a point beyond the same, in a socket 31 which is adapted to receive a drill 32 or other instrument to be sharpened, the outer end of the latter being suitably guided and supported by means of a collar 33 in turn supported by a standard 34 having its lower end firmly secured to the base 10.

Now with a view of providing means which will rotate the shaft 30, and consequently the drill 32, as well as feed the latter against the base of the grinding element 24, and at the same time cease feeding automatically the drill, when a sufficient portion of the cutting edge of the same has been ground down, I conveniently provide a connecting medium, such as a chain 35, which extends between the shaft 14 and the shaft 30, and suitably engages the same, as for instance by means of sprocket gears 36, secured to each of these shafts.

Thus the driving force of the former shaft will be transmitted to the latter, which will effect a rotation of the drill 32. Reference is now had to Figure 5 which clearly illustrates the construction which permits of the automatic feeding of the traveler 27, and consequently the drill 32 towards the grinding element 24, and the automatic stoppage, after a sufficient depth has been cut.

The operator primarily ascertains the depth of the drill 32, i. e., its cutting edges, and judges the depth to which it will be necessary to grind the point of the drill to produce the cutting edge desired. After this has been done, the drill is set in the socket 31, and the latter moved forward by virtue of the traveler 27, which in turn is projected by rotating the shaft 28, by any suitable means such as a hand-wheel 37, until the point of the drill comes in contact with the grinding element 24. It will be noted that the cam 38 is movably secured upon the shaft 30, and this cam may be rigidly associated with this shaft by any suitable means such as a set-screw 39, this being desired.

Upon the operator having moved the parts in the manner aforestated, the cam 38 is moved rearwardly along the shaft 30 for a distance equivalent to that which is to be ground away from the tip of the drill, i. e., to the position indicated in dotted lines in Figure 1. Upon the set-screw 39, or other securing agent being now actuated, it will be obvious that the cam 38 will move with the shaft 30. Thus upon each rotation of the shaft 30, the cam will strike the actuating lever 40, which conveniently rockingly encircles the rod 28, and is retained within the path of the cam 38 when the same is in the position indicated in dotted lines in Figure 1, by any suitable means, such as a spring 41. A pawl 42 is rockingly secured to the lever 40, and is pressed into engagement with an annular ratchet 43 fixedly secured to the rod 28.

Thus it will be understood that upon each rotation of the shaft 30, assuming that the lever 40 is in the path of the cam 38, the lever will be rocked, and consequently the pawl 42 will move the ratchet 43 forward, the lever being returned to its normal position by means of the spring 41. This operation will be continued to a point at which the cutting end of the drill 32 has been ground away to the point desired, and in a manner hereinafter more fully described, subsequent to which the cam 38 by virtue of having moved forward with the shaft 30 actuated by the traveler 27, will have cleared the lever 40, the latter remaining in a fixed plane. Upon this occurring, the lever will not be actuated further, and consequently the drill will not be fed further towards the grinding element 24.

It will now be noted that the shaft 30 further carries a suitable gearing 44, with which beveled gears 45 mesh. These latter

gears are mounted upon shafts 46 rotatably supported within bearings carried by a bracket, such as 47, and these shafts extend transversely to the shaft 30, and it will be appreciated that upon the rotation of the latter, that the same will have rotation imparted to them. A cam 48 is now secured to one of these shafts, which cam, has been shown in detail in Figure 4.

The cam illustrated in Figure 3, and designated by the reference numeral 49, is secured to the second of the shafts 46, so that upon these shafts being rotated, both of the cams will actuate. A rod 50, slidably supported as at 51, has one of its ends pivotally secured, as at 52, to a portion 53 of the base table 18, which extended portion projects below the pivot pin 19. The opposite end of the rod 50 lies adjacent the surface of the cam 48, and is pressed into intimate engagement therewith, by any suitable means, such as a compression spring 54 co-operating with the extended portion 53 of the base table 18.

Thus, upon the cam 48 being rotated, the rod 50 will be reciprocated, resulting in a rocking motion of the table 16, and its supported elements, in the manner illustrated diagrammatically in Figure 7.

A second rod 55 has one of its ends pivotally secured as at 56 to an abutment 57 forming a part of the table 16, it being noted that this abutment may conveniently be provided with a plurality of openings 58 permitting of adjustment of the rod 55. The opposite end of the rod 55, similar to the rod 50, lies adjacent the face of the cam 49 and is pressed into intimate engagement therewith by means of a spring 59, extending between a fixed portion of the base 10, and the abutment 57.

Thus upon the cam 49 being rotated, the rod 55 will be reciprocated, and will serve to oscillate the table 16 around the pin 17, supporting the same upon the base 10. This motion has been illustrated diagrammatically in Figure 6 in which the relationship of the parts, and their movement, one with respect to the other, has been clearly illustrated.

It is now to be noted that upon the driving member 13, and pulley 23 being rotated, assuming that a drill 32 has been placed in position in the socket 31, and that the feed of the shaft 30 has been properly set, that the drill 32 will be rotated, and be brought to bear against the grinding element 24, which grinding element also rotates. As has been aforedescribed, the rotation of the member 32 being sharpened, and its forward motion, will be continued until the point of the same has been ground away to a predetermined depth, subsequent to which the feed will cease due to the cam's 38 having cleared the lever 40 so that no further grinding may be effected between the point of the drill 32, or other drill being ground, and the grinding element 24.

With a view of producing true cutting lips, each of which will be equal in length, and in angle of inclination, it is now to be noted that the axis of rotation of the table 16 upon the base 10, if continued, would intersect the axis of the tool being ground, as has been clearly indicated in Figure 1, and that this intersection would be in a line approximately at right angles to the longitudinal axis of the drill 32. Thus each lip contacts with the face of the grinding element 24 at an equal angle, and any unequalness of angularity of the cutting edges or lips will be quickly corrected.

It will be seen that the rod 50 will serve to operate the base table 18, and table 16 supported thereby to conform to the lips of the drill, this operation being synchronized in all of its respects by virtue of the fact that the rod 50 is operated by the cam 48, which is in true ratio with respect to the rotation of the shaft 30.

To provide a back-cut, and properly equalize the cutting edges or lips of the drill, the rod 55 is actuated to produce a motion of the parts diagrammatically illustrated in Figure 6. This operation in turn will be synchronized and retained in power ratio to the rotation of the shaft 30 by virtue of the fact that the rod 55 is actuated by the cam 49, in turn fixed to the shaft 46 actuated by the gearing 44 associated with the shaft 30.

With a view of providing a suitable medium, to prevent any accidental throwing of the table 16 to a point beyond that line indicated in Figure 1, a stop may conveniently be provided, which stop preferably includes a standard 60 associated with the base 10 and carrying any convenient form of set screw 61, which is adapted to contact with the forward face of the table 16, thus preventing the rod 50 from throwing the table 16 beyond the line desired.

A grinding machine produced in accordance with my invention, will, as readily be appreciated have none of the inherent defects of the machines heretofore placed upon the market for this purpose, and by means of the same a drill will have its outer end ground true in all respects, as has been brought out in the preamble.

Obviously my invention is susceptible to numerous modifications in construction without departing from the scope of my claims, which are—

I claim:

1. A grinding machine, including a grinding element, a shaft, a tool receiving socket attached to said shaft, a traveler supporting said shaft and being adapted to move the same longitudinally, a screw threaded rod engaging said traveler whereby to move the

same, an annular ratchet member attached to said rod, a lever rotatably secured to said rod, a pawl attached to said lever and adapted to engage said ratchet, a cam fixedly secured to said shaft and adapted to rotate with the same, said cam being capable of bearing against said lever whereby to move the same and consequently rotate said rod.

2. A grinding machine, including a grinding element, a shaft, a tool receiving socket attached to said shaft, a traveler supporting said shaft and being adapted to move the same longitudinally, a screw threaded rod engaging said traveler whereby to move the same, an annular ratchet member attached to said rod, a lever rotatably secured to said rod, a pawl attached to said lever and adapted to engage said ratchet, a cam fixedly secured to said shaft and adapted to rotate with the same, said cam being capable of bearing against said lever whereby to move the same and consequently rotate said rod, and a spring for returning said lever to its normal position.

3. A grinding machine, including a grinding element, a shaft, a tool receiving socket attached to said shaft, a traveler supporting said shaft and being adapted to move the same longitudinally, a screw threaded rod engaging said traveler whereby to move the same, an annular ratchet member attached to said rod, a lever rotatably secured to said rod, a pawl attached to said lever and adapted to engage said ratchet, a cam fixedly secured to said shaft and adapted to rotate with the same, said cam being capable of bearing against said lever whereby to move the same and consequently rotate said rod, a spring for returning said lever to its normal position, said cam moving with said shaft, whereby upon said cam moving beyond the lever, the traveler will be retained in a fixed plane.

4. A grinding machine, including a grinding element, a shaft, a tool receiving socket attached to said shaft, means for rotating said shaft and feeding the same towards said grinding element, a turn table, a base, a base table rockingly supported upon said base, a turn table rockingly supported upon said base table, said grinding element being supported upon said turn table, and means extending between said shaft and turn table for oscillating the latter upon the shaft being rotated.

5. A grinding machine, including a grinding element, a shaft, a tool receiving socket attached to said shaft, means for rotating said shaft and feeding the same towards said grinding element, a turn table, a base, a base table rockingly supported upon said base, a turn table rockingly supported upon said base table, said grinding element being supported upon said turn table, and means extending between said shaft and base table for rocking the latter upon the rotation of the former.

6. A grinding machine, including a grinding element, a shaft, a tool receiving socket attached to said shaft, means for rotating said shaft and feeding the same towards said grinding element, a base, a base table rockingly supported upon said base, a turn table rockingly supported upon said base table, said grinding element being supported upon said turn table, and means extending between said shaft, base table, and its associated elements for effecting a rocking and oscillating of the turn table supporting said grinding element upon the shaft being rotated.

7. A grinding machine, including a shaft, a tool receiving socket attached to said shaft, a base, a base table rockingly supported upon said base, a turn table rockingly supported upon said base table, a longitudinally adjustable shaft rotatably mounted upon said turn table, means for rotating the socket shaft and feeding the same towards said grinding element, and means extending between said shaft, base table and its associated elements for effecting a rocking and oscillating of the turn table supporting said grinding element, upon the socket shaft being rotated.

8. A grinding machine, including a shaft, a tool receiving socket attached to said shaft, a base, a base table rockingly supported upon said base, said base table presenting an angularly disposed upper face, a turn table provided with a lower face formed at an angle corresponding to the upper face of the base table, and oscillatingly supported upon the same, a rotatable shaft mounted upon said turn table, a grinding element attached to said shaft, and means for rotating the socket shaft and feeding the same towards said grinding element, and means extending between said shaft, base table and its associated elements for effecting a rocking and oscillating of the turn table supporting said grinding element upon the socket shaft being rotated.

9. A grinding machine including a base, a table movably supported upon said base, a grinding element carried by said table, a tool-receiving member extending adjacent said grinding element, and means for rocking said grinding element in a plane in line with said member.

10. A grinding machine including a base, a table movably supported upon said base, a grinding element carried by said table, a tool-receiving member extending adjacent said grinding element, and means for rocking and oscillating said grinding element with respect to said member.

11. A grinding machine including a base, a table movably supported upon said base, a grinding element carried by said table, a

tool-receiving member extending adjacent said grinding element, means for rocking and oscillating said grinding element with respect to said member, the axis of oscillation of said element being coincident with the point upon the face of said grinding element at which a tool carried by said member will contact with the same.

12. A grinding machine including a base, a table movably supported upon said base, a grinding element carried by said table, a tool-receiving member extending adjacent said grinding element, a shaft carrying said member, a driving member, and a rod extending between and connected to said driving member and table for causing a movement of the latter.

13. A grinding machine including a base, a table movably supported upon said base, a grinding element carried by said table, a tool-receiving member extending adjacent said grinding element, a shaft carrying said member, a driving member, a rod having one of its ends connected to said drive member, and means permitting of said rod being adjustably connected to said table whereby to vary the movement of the latter.

14. A grinding machine including a base, a table movably supported upon said base, a grinding element carried by said table, a tool-receiving member extending adjacent said grinding element, a shaft carrying said member, a driving member, an arm secured to said table, and a rod extending between and connected to said driving member and the arm, respectively.

15. A grinding machine including a base, a table movably supported upon said base, a grinding element carried by said table, a tool-receiving member extending adjacent said grinding element, a shaft carrying said member, a driving member, an arm secured to said table, a spring interposed between said arm and base, and a rod extending between and connected to said driving member and the arm, respectively.

16. A grinding machine including a base, a table movably supported upon said base, a grinding element carried by said table, a tool-receiving member extending adjacent said grinding element, a shaft carrying said member, a driving member, a cam actuated by said driving member, and a rod having one of its ends connected to said table, its opposite end lying adjacent to and being adapted to contact with said cam.

17. A grinding machine including a base, a table rockingly carried by said base, a grinding element carried by said table, a tool-receiving member extending adjacent to said grinding element, a rod connected to said table, a secondary rod connected to said first-mentioned rod, and means for reciprocating said secondary rod.

18. A grinding machine including a base, a table rockingly carried by said base, a grinding element carried by said table, a tool-receiving member extending adjacent to said grinding element, a rod connected to said table, a secondary rod connected to said first-mentioned rod, means for projecting said secondary rod, and a spring interposed between said base and said first-mentioned rod for effecting a retraction of said secondary rod.

19. A grinding machine including a base, a table rockingly supported upon said base, a grinding element carried by said table, a tool-receiving member extending adjacent said grinding element, a movable shaft carrying said member, a driving member, a rod connected to said table, a cam secured to said driving member, and a secondary rod having one of its ends connected to said first-mentioned rod, its opposite end lying adjacent to and being adapted to contact with said cam.

20. A grinding member including a base, a table and a turntable, a grinding element carried by said turntable, a tool-receiving member extending adjacent said grinding element, a movable shaft carrying said member, means for driving said shaft, a pin having one of its ends secured to said table, its opposite end being connected to said turntable, and a spring enclosing said pin and bearing against the under face of said turntable.

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