

No. 846,303.

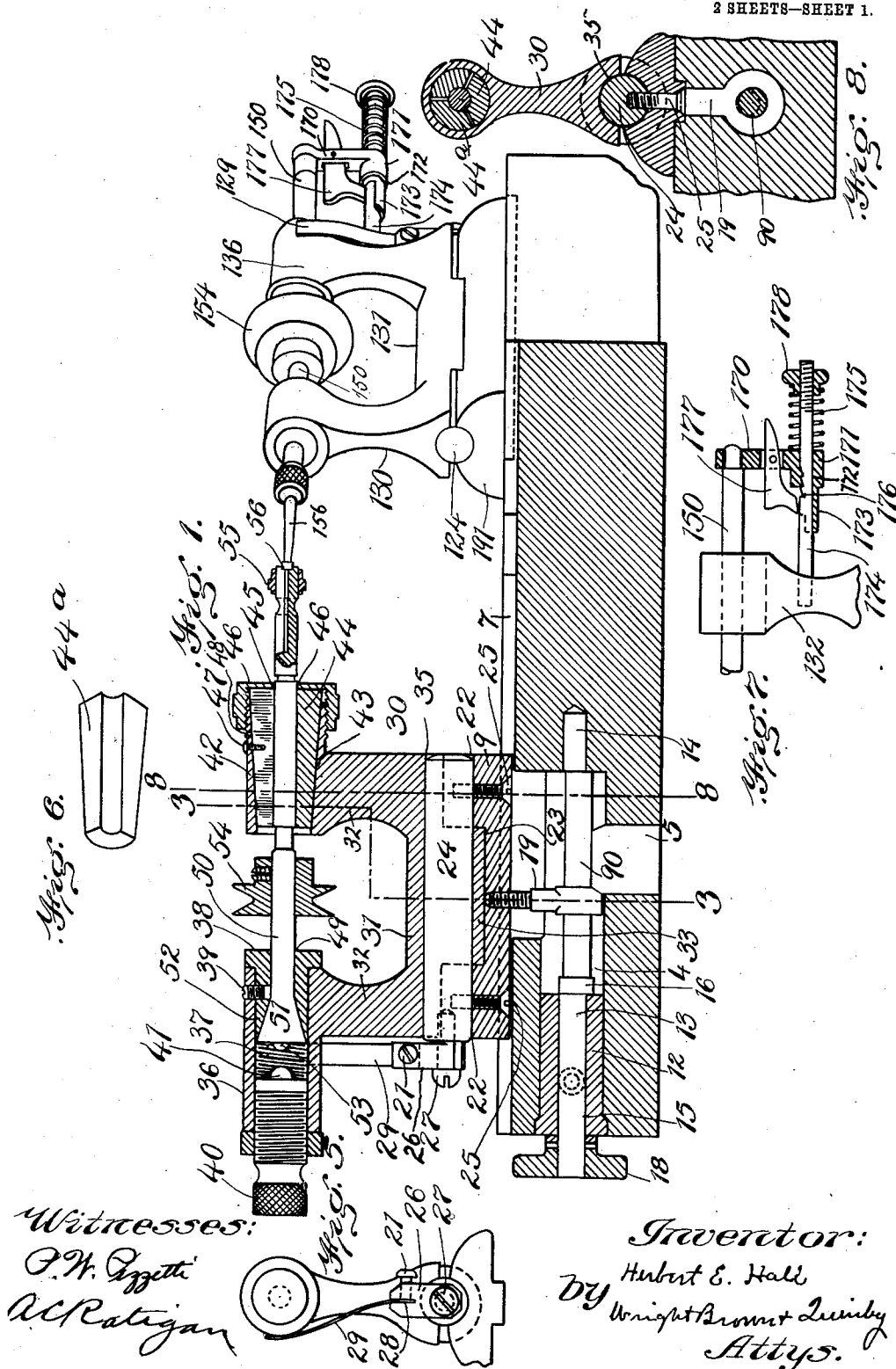
H. E. HALL.

PATENTED MAR. 5, 1907.

CUTTING AND POLISHING MACHINE.

APPLICATION FILED FEB. 18, 1904.

2 SHEETS—SHEET 1.



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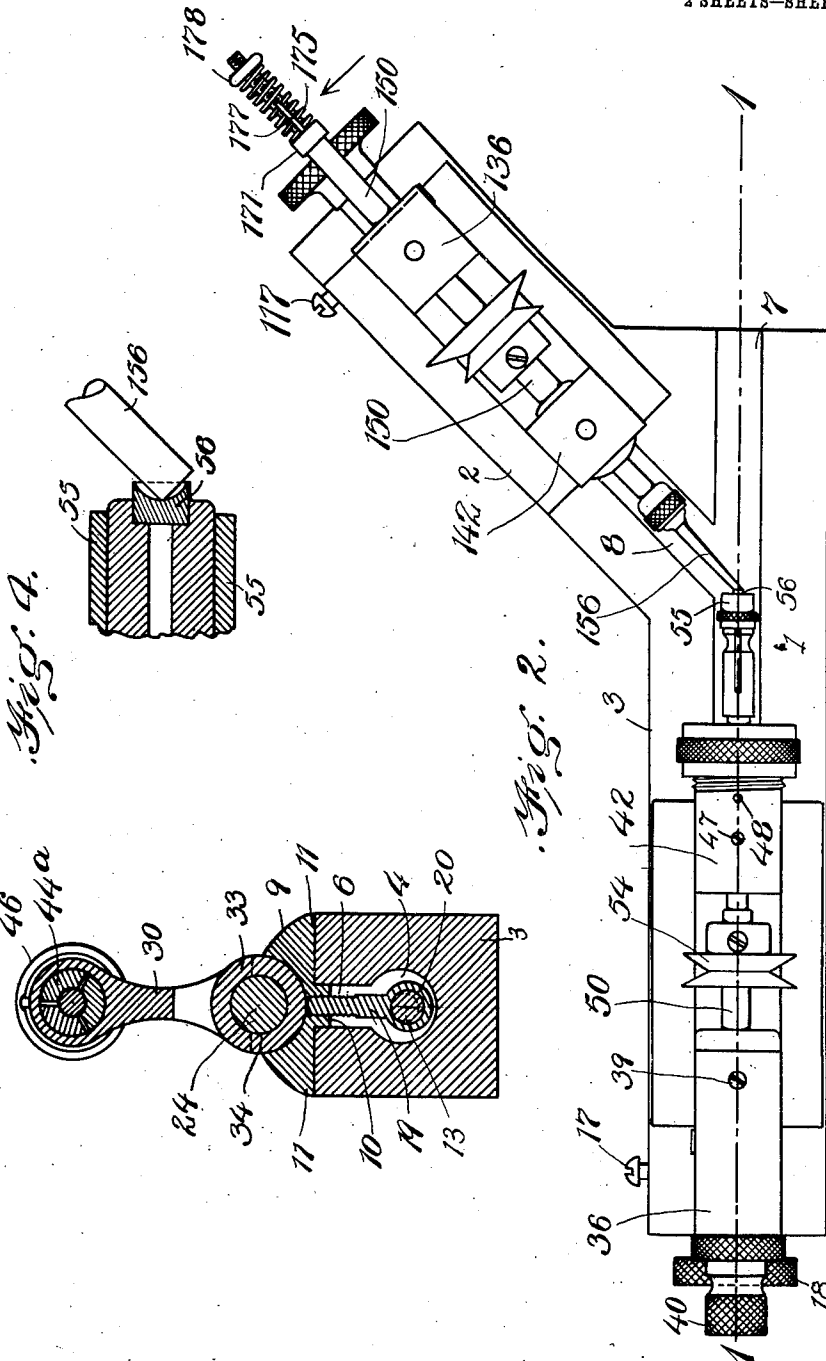


Fig. 3.

Fig. 4.

Fig. 2.

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UNITED STATES PATENT OFFICE.

HERBERT E. HALL, OF LYNN, MASSACHUSETTS.

CUTTING AND POLISHING MACHINE.

No. 846,303.

Specification of Letters Patent.

Patented March 5, 1907.

Application filed February 18, 1904. Serial No. 194,211.

To all whom it may concern:

Be it known that I, HERBERT E. HALL, of Lynn, in the county of Essex and State of Massachusetts, have invented certain new and useful Improvements in Cutting and Polishing Machines, of which the following is a specification.

This invention relates to a jewel cutting and polishing machine.

Figure 1 in front elevation shows a machine constructed in accordance with my invention, the chuck-head being shown in section corresponding to the line 1 1 of Fig. 2. Fig. 2 is a top plan view of the machine shown in Fig. 1. Fig. 3 is a cross-sectional view on the line 3 3 of Fig. 1. Fig. 4 is a detail view showing the end of the chuck, the jewel in the chuck, and the end of the tool in engagement with the jewel. Fig. 5 is an end view of the chuck-head showing the arrangement of the spring that engages said head. Fig. 6 is a detail view of one of the sections of the sectional bearings. Fig. 7 is a detail view showing the means for imparting to the tool-shaft a yielding forward movement Fig. 8 is a vertical cross-sectional view on the line 8 8 of Fig. 1.

The same letters of reference indicate the same parts in all the figures.

In the drawings, 1 represents a bed or framework comprising two arms 2 3, arranged at an angle shown as one hundred and thirty degrees to each other.

4 represents a circular chamber formed in the end of the arm 3 and extending from the end of the arm toward the junction of the arms 2 and 3. A hole 5 extends from the bottom of this chamber through the bottom of the arm 3. A slot 6, formed in the central part of arm 3, extends from the top of the arm to the end of the chamber 4 and, as shown, is about one-half the length of said chamber, although this proportion is of no special importance.

7 represents a groove cut in the top side of the arm 3 and running the length of the latter and coinciding with the slot 5 for the length of the latter.

8 represents a like groove in the top side of the arm 2.

9 represents a sliding chuck-base, formed on the under side with a rib 10, adapted to be arranged and slide in the groove 7. The chuck-base 9 is formed on either side of the rib 10 with shoulders 11 11, adapted to rest

and slide on the upper side of the arm 3. A plug 12 is secured in the front end of the chamber 4. A shaft or pintle 13, arranged in the chamber 4, has its rear end arranged in a complemental recess 14 in the wall of the arm 3 at the rear end of the chamber 4. The front end of the pintle is arranged in and extends through a complemental hole 15 in the plug 12. The recess 14 and hole 15 serve as bearings. A collar 16, secured to the pintle 13 and bearing against the inner end of the plug 12, retains the pintle 13 in position. A screw 17 holds the plug 12 in place. A milled disk 18, secured to the outer end of the pintle 13, serves as a means whereby said pintle may be rotated in either direction.

19 represents a lug secured in any preferred way to the under side of the rib 10 midway the ends of the latter. This lug is formed with an eye 20, adapted to receive the pintle 13. The pintle 13 between its ends is offset to form an eccentric 21, the latter being arranged in the eye 20. By this means the base 9 can be retained in any desired position by turning the disk 18 to lock the eccentric. The base 9 is, as shown, semicircular in cross-section, with the diameter resting upon the top of the arm 3. The ends of the top or curved side of the base 9 are formed with semicircular longitudinal grooves 22 22, between which as an enlargement is formed a semicircular recess 23. The walls of the grooves 22 22 at either end of the recess 23 serve as bearings to receive a cylindrical pin 24. Screws 25 25, passing through the rib 10 and into ends of the pin 24, secure the latter in place.

26 represents a lug arranged upon an extension of the pin 24 and adapted to be held in any desired position of circumferential adjustment by means of the head of a screw 27, tapped into the end of the lug 24. A slot 28 is formed in the end of the lug 26, and in the slot is secured one end of a leaf-spring 29. A screw 21, carried in the end of the lug 26 and arranged to engage the end of the spring 29, serves to retain the spring in the lug. The free end of this spring engaging the extension 36, as hereinafter described, the tension or resistance of the spring can be adjusted by turning the lug 26 and locking the latter in the desired position by means of the head of the screw 27.

30 represents a chuck-head formed with a base 31 and two uprights 32—one at each end.

The under side of the base between the plane of the two uprights is formed with a semicircular lug 33, adapted to fit and move in the recess 23, being held against longitudinal motion by the end walls of the recess 23. The lug 33 is formed with a cylindrical hole 34, while the under side of each upright 32 is formed with semicircular grooves 35 35, whose surfaces correspond and aline with the surface of the upper half of the hole 34, the axis of the hole 34 and the semicircular grooves 22 22 and the complementary grooves 35 35 being the axis of the pin 24, the latter being arranged in the hole 34 and the grooves 35 35. By this arrangement the chuck-head can be given a lateral pivotal movement upon the pin 24. The end of the outer upright 32 is provided with a horizontal extension 36, formed with a cylindrical chamber 37. A plug 38 of Babbitt metal is secured in the inner end of this chamber 37 by means of a screw 39. The walls of the outer end of this chamber are formed with screw-threads to receive complementary screw-threads formed upon an adjusting-screw 40, that carries at its inner end an axially-arranged semicircular-shaped projection 41, adapted to serve as an adjustable thrust-bearing, hereinafter described. The end of the inner upright 32 is provided with a horizontal extension 42, formed with a frusto-conical-shaped chamber 43, the axis of which coincides with that of the cylindrical chamber 37. The smaller diameter of the chamber 43 is, as shown, at the inner end. In the chamber 43 is arranged a frusto-conical-shaped plug 44, composed of three sections 44^a. A cylindrical hole or bearing 45 is formed in this plug 44. A cap 46 closes the end of the outer end of the chamber 43 and serves, among other things, to hold the plug 44 in place against endwise displacement and to take up wear. This cap is formed with an axial hole 46, corresponding with the bearing 45. A pin 47, passing through the wall of the chamber 43 and extending between two sections 44^a, Fig. 6, of the plug 44, holds the latter against sidewise movement. An oil-hole 48 is also formed in said wall. The plug 38 is shown as formed with a cylindrical hole or bearing 49 in line with the bearing 45. The outer end of the bearing 49 is enlarged to form a frusto-conical-shaped bearing 52.

50 represents a chuck-shaft arranged in the bearings 45 and 49. The outer end of this chuck-shaft 50 is enlarged to form a frusto-conical extension 51, arranged in and fitting the bearing 52. Upon the outer end of the extension 51 is axially arranged a semicircular-shaped projection 53, adapted to engage the complementary projection 41 on the inner end of the screw 40. A grooved pulley 54, fast on the shaft 50 between the two uprights 32 32, serves as a means by which power can be applied to the chuck-shaft 50 to rotate the

latter. The inner end of the shaft 50 carries a chuck 55 of any preferred kind for carrying the work 56, here shown as a jewel.

As most of the parts upon the arm 2 are complementary to and substantial duplicates of like parts upon the arm 3, a description of such duplicate parts in connection with the arm 3 will suffice for both, the duplicate parts on the arm 2 being distinguished from like parts on the arm 3 by the numeral "1," prefixed to the numeral indicating the part on the arm 3.

The tool-shaft 150 is mounted slidably in bearings of Babbitt or any suitable metal, carried by the extensions 136 142, respectively. The tool-shaft 150 projects beyond the chamber 137, and to such projection is secured a depending arm 170. A boss 171 is formed on the lower end of the arm 170 and provided with a cylindrical hole or bearing 172. The wall of the lower half of the bearing 172 is extended inward, as at 173. A cylindrical pin 174 is secured in the outer upright 132 and is arranged in the bearing 172. A helical spring 175 is arranged on the pin 174 between the outer side of the arm 170 and an adjusting-nut 178, carried by the free or rear end of the pin 174. By this arrangement the tool-shaft 150 is yieldingly forced inward against the work. The amount or degree of such inward thrust, depending upon the force exerted by the spring 175, can be adjusted at will. Detent-notches 176 are formed on the top of the pin 174 back of the point occupied by the boss 171 when the tool is withdrawn back of the position or plane occupied by the work. A detent 177, carried by the arm 171, is arranged to engage said notches 176 and hold the tool 156 in its retracted position when desired.

The inner end of the shaft 150 carries a chuck 155 of any preferred construction. In this chuck is secured a tool 156, arranged to engage the work 56. The free end of the spring 29 is arranged against the rear side of the extension 36 in Fig. 1, while the free end of the spring 129 is arranged against the front side of the extension 136 in Fig. 1. The joint action of the two springs yieldingly keeps the tool in engagement with the work, the tool following into the work on the true center of rotation of the work; but for the springs it would be impractical to keep the tool true to the center of the work and substantially impossible with this angular arrangement to make the tool follow into the work from the center axis of rotation of the latter. These springs, further, keep the tool and work together, and prevent one from jumping or moving away from the other and out of their predetermined alinement. The angle—one hundred and thirty degrees—at which the tool and work engage enables me to engage the work with the periphery of the end of a cylindrical tool rather than with the

point of a tool, it being understood, of course, that the work and the tool rotate in opposite directions and at a very rapid speed. By this arrangement I overcome the dead-center difficulty which exists where the tool is arranged in the same axial line as that of the work. The periphery of the tool 156 engages the walls of the cavity formed in the work or by the tool when the latter is used to make the cavity or engages the sides of a previously-formed cavity when the tool is used for polishing. The front or advance-point on the periphery of the tool is the one that follows into the work on the center of the axis of rotation of the work. By this arrangement an even and true cavity is formed in the jewel, free from imperfections due to dead-center and other difficulties in prior types of machines, as the tool 156 is advanced into the work yieldingly by means of the springs 175, hereinbefore referred to, as such advance of the tool into the work takes the place of springs 29 and 129, keeps the tool and work in engagement, and insures travel or progress of the working edge of the tool along the axis of rotation of the work 56, held by the chuck 55.

While under some conditions—such as perfect engagement of the tool when used as a polisher with the walls of a true cavity previously formed in the work, uniform action of the belts, &c.—the tool and the work will maintain the proper relation without the springs 29 and 129, yet for practical operation and to avoid displacement, owing to imperfections and irregularities of motion or other action, I prefer to use the springs or some equivalent means for preventing the disengaging of the tool and the work and to keep said parts together. It is also to be understood that I may use any means for advancing the tool-shaft in place of the spring 175 and its adjuncts, the purpose being to advance the tool as its action on the work requires, which may be done, of course, by the hand of the operator, if necessary. The hands of the operator may also be employed in place of the springs 29 and 129.

When this machine is used for polishing a cavity previously formed in the jewel or work 56, I prefer to make the tool 156 out of boxwood or other woods well known to the trade for this purpose. With this wooden or tool of other material for polishing I may use various forms of polishing powder or dust, as is well known in the art. When the machine is to be used to form a cavity in a jewel, the tool 156 may be made of soft steel or other material suitable for that particular work.

While the peripheral engagement of the tool with the work can be secured when the tool and work-shaft are positioned at less than or more than one hundred and thirty degrees apart, I prefer this position as giving the greater efficiency for the peripheral edge

of the tool. As the tool-shaft is carried more than one hundred and thirty degrees away from the work-shaft or so that its axis approaches the line 1 1 of the axis of the tool-shaft in Fig. 2, the informity of the "dead-center" of a tool begins to develop, while, on the other hand, as the axis of the tool-shaft is moved to the position of an angle less than one hundred and thirty degrees to the axis of the work shown on line 1 1 in Fig. 2 the cylinder or tool 156 tends to be turned out of the work, so that the side will engage the face of the work rather than its peripheral edge. While positions of the tool-shaft less than one hundred and thirty degrees might be used by employing specially-constructed tools, I prefer the arrangement shown, since I can employ tools of a simple construction—that is, plain cylinders.

The springs 29, 129, and 175 exert a light action. Any heavy or violent action of the springs in this size and form of machine would be unsuitable for the work to be done, the purpose of the springs being to maintain engagement, the work to be none not requiring any excessive pressure. If work other than jewel-work has to be done, the springs would have to be arranged and adjusted according to the work.

While the projection 41 and the projection 53 in Fig. 1 are shown out of engagement for clearness of illustration, it will be understood that the said projections are in engagement during the operation of the machine, the screw 40 being turned up until the projections contact with each other.

The machine will cut and polish jewels out of diamonds, sapphire, garnet, agate, or other softer grade of stone, if they are properly centered when started. The pivoting of the two heads keeps the center the same as the jewel wears away in its polishing, making it a following-center and keeping the same angle.

I believe myself to be the first to provide a cutting and polishing machine where the tool and work have a peripheral engagement, and I desire to claim the same in the broadest possible legal manner.

Having thus explained the nature of my invention and described a way of making and using the same, although without attempting to set forth all of the forms in which it may be made or all of the modes of its use, what I claim, and desire to secure by Letters Patent, is—

1. A machine of the character described, comprising laterally-movable work-holding and tool-carrying members, the supports for said members being relatively positioned to cause the lateral path of movement of one member to be at an angle to the lateral path of movement of the other member.

2. A machine of the character described, comprising laterally-movable work-holding

and tool-carrying members, the supports for said members being relatively positioned to cause the lateral path of movement of one member to be at an acute angle to the lateral path of movement of the other member.

3. A machine of the character described, comprising laterally-movable work-holding and tool-carrying members, the supports for said members being relatively positioned to cause the lateral path of movement of one member to be at an acute angle to the lateral path of movement of the other member, and springs for imparting a yielding pressure of said members in opposite directions.

4. A machine of the character described, comprising laterally-movable work-holding and tool-carrying members, the supports for said members being relatively positioned to cause the lateral path of movement of one member to be at an acute angle to the lateral path of movement of the other member, the work and tool carried by said members being adapted to abut in a relatively endwise direction, and springs actuating said members in opposite directions to cause said work and tool to yieldingly abut.

5. In a machine of the character described comprising laterally-movable work-holding

and tool-carrying members, the supports for said members being relatively positioned to cause the lateral path of movement of one member to be at an acute angle to the lateral path of movement of the other member, the work and tool carried by said members being adapted to abut in a relatively endwise direction, springs actuating said members in opposite directions to cause said work and tool to yieldingly abut, means being provided for adjusting the tool endwise of its carrying member.

6. In a machine of the character described, a pivoted work-holder, a pivoted tool-holder, said holders having their axes at substantially an angle of one hundred and thirty degrees relatively to each other, and means for causing lateral movement of the tool-holder and work-holder toward each other whereby the tool is made to follow the center of the work at all positions.

In testimony whereof I have affixed my signature in presence of two witnesses.

HERBERT E. HALL.

Witnesses:

P. W. PEZZETTI,
R. BULLOCK.