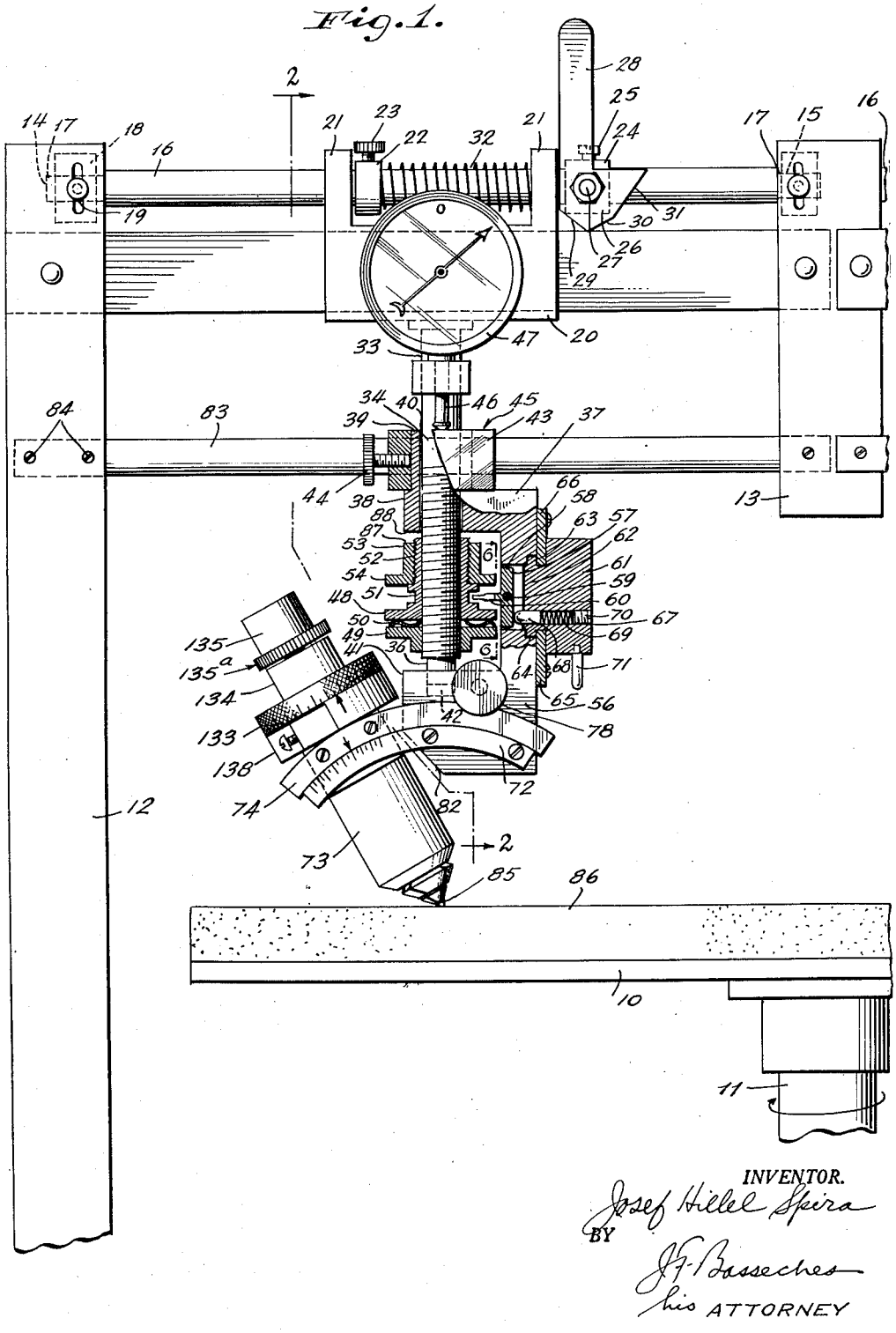
Dec. 19, 1950 J. H. SPIRA 2,534,384

APPARATUS FOR POLISHING OR FORMING FACETS ON GEMS, DIAMONDS OR THE LIKE

Original Filed March 31, 1942 2 Sheets-Sheet 1

Fig. 1.



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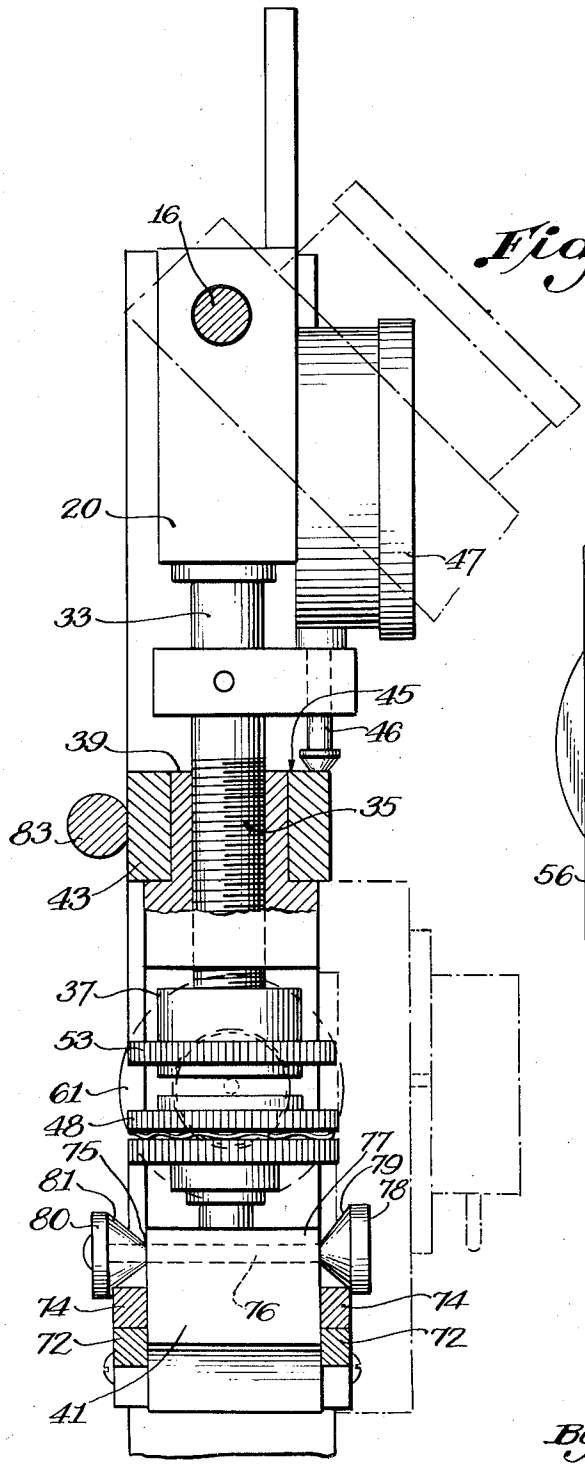


Fig. 2.

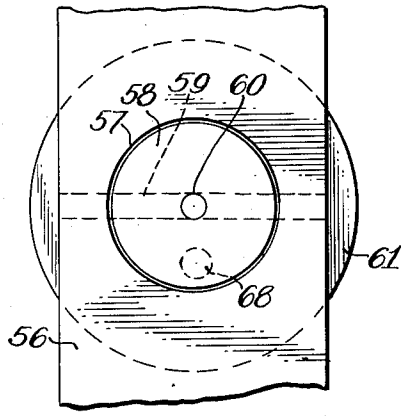


Fig. 3.

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Patented Dec. 19, 1950 2,534,384

UNITED STATES PATENT OFFICE

2,534,384

APPARATUS FOR POLISHING OR FORMING FACETS ON GEMS, DIAMONDS, OR THE LIKE

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Original application March 31, 1942, Serial No. 437,056, now Patent No. 2,393,939, dated January 29, 1946. Divided and this application January 25, 1946, Serial No. 643,301. In Brazil March 31, 1941

4 Claims. (Cl. 51—229)

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This invention has as its object the provision of a method and apparatus for grinding or cutting the facets upon gems, or what is generally referred to as the polishing of gems, particularly diamonds, which hitherto largely have been worked successfully only by manual labor, which required unusual skill and experience.

The present invention has for its object the grinding or polishing of the facets on gems by semi-automatic means which minimizes the extraordinary skill heretofore necessary, and the provision of a new and novel method.

The present invention makes possible a faster production of the operations for finishing these gems, requiring less skill than the heretofore known methods, and makes possible the effecting of considerable economies involved in carrying out these hitherto highly expensive and laborious operations.

Heretofore the method of forming the facets upon gems has been under the strict supervision of a skilled worker who ascertained the accuracy of his work by constant inspection, which was dependent upon the skill acquired through many years of experience.

In the present invention, in order more economically to increase production and largely to eliminate the element of unusual skill, and provide semi-automatic devices for accomplishing the desired end, I have departed from the age-old and obvious procedure in polishing gems, particularly diamonds, with a consequent simplification of this laborious procedure.

Coordinately, my invention resides in the provision of novel apparatus for facilitating the practice of said method.

To attain these objects and such further objects as may appear herein or be hereinafter pointed out, I make reference to the accompanying drawings, forming a part hereof, in which—

Figure 1 is a side elevation of my device, fragments whereof are shown in section;

Figure 2 is a fragmentary end elevation thereof, taken in the direction of line 2—2 of Figure 1;

Figure 3 is a fragmentary sectional view taken on the line 6—6 of Figure 1.

It is contemplated by my invention to provide a new method of polishing or facetting gems, more particularly diamonds, which involves a departure from the age-old method heretofore

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employed. For this purpose, I first provide the raw stock with a table section and a pavilion or base section. The base section is mounted in a work holder or dop to expose the pavilion or base. This pavilion or base is first formed with the facets arranged pyramidally thereon, in sufficient number to provide an axially accurate system in respect of the table so that the facets of the pavilion are symmetrical to the table and the axial line through the pyramidal section is at right angles to the table. Thereupon, the pyramidally facetted pavilion serves as the means for axially rotating the gem to expose the crown or bezel, and polish the crown or bezel with the requisite facets.

The sequence of steps in accordance with my method enables me quickly and facilely to perform the polishing or facetting operations more economically and by semi-automatic apparatus, thereby to minimize the requirement to use unusually skilled operators.

For the practice of the novel method indicated, I will now make reference to the drawings forming a part hereof in which novel apparatus has been devised by me to facilitate the practice of the method herein mentioned.

For this purpose, I illustrate in Figure 1 a general assembly for polishing or facetting wherein 10 represents the grinding wheel or skeif mounted upon the shaft 11, the details of which for securing a true rotation are well known to those skilled in the art. Standards 12 and 13 are provided with bearings 14 and 15, supporting the shaft 16. The standard 13 is spaced from the turntable to clear the same adjacent the axial line through the turntable and shaft therefor. The pintles 17 of the shaft 16 are fixedly mounted. The left hand pintle 17 rests in a bearing block 18 which is provided with adjusting means 19, whereby a truly horizontal adjustment of the shaft 16 may be effected. Mounted upon the shaft 16 is a block 20, having hangers 21 forming bearings through which the shaft 16 extends.

Spaced between these hangers I provide a collar 22 having a set screw 23. Also mounted upon the shaft is a locating block 24, provided with a set screw 25. The block 24 limits the position of the block 20 in the right hand direction.

Spaced between the collar 22 and the right hand hanger, a coiled spring 32 is located, there-

by flexibly locating the slidable movement of the block on the shaft 16. For laterally moving the block 20 upon the shaft 16, I provide a camming member 26, pivotally mounted upon the shaft 27, having an operating handle 28 and camming faces 29, 30 and 31. Each of the camming faces 29, 30 and 31 is at a different distance radially from the center of the shaft 27, to provide a variable throw to the sliding movement of the block as the handle 28 is manipulated.

Axially suspended from the block 20 is a vertical shaft 33. The shaft 33 is directed downwardly and is formed with a bearing surface 34 at its medial point, and a screw threaded portion 35 beyond the portion 34. It then terminates into a neck 36. The shaft 33 is disposed into the vertical D-shaped block 37, the upper branch whereof 38 is provided with a collar 39 orificed at 40 to receive the shaft 33. The lower branch 41 is recessed at 42 to receive the neck 36 of the vertical shaft.

Mounted upon the collar 39 is a square guide block 43, provided with a set screw 44 to assure a fixed engagement of the guide block 43 with the collar 39. The upper surface 45 of the guide block 43 is arranged to receive the finger 46 of the dial indicator 47 mounted on the face of the block 20.

With the shaft 33 extending through the orifice 40, there is provided the knurled threaded member 48, engaging the threaded section 35 of the shaft 33. A lock nut 49 is spaced therebelow after interposing the spring washer 50. The threaded member 48 is provided with an annularly slotted collar 51, having a threaded neck 52, to which is screw threaded the depth determining collar 53 having a knurled flange 54 adapted to rest upon the flange 55 of the collar 51.

Through the vertical branch 56 of the block 37, I provide an orifice 57. Within the orifice 57, adjacent the annularly slotted collar 51, I mount a disk 58, horizontally pivoted by the pin 59. The inner face of the disk 58 is formed with a finger 60, which is extended into the slot of the annularly formed collar 51.

Disposed within the orifice 57 is a rotatable knob 61, having a neck 62 extending into the orifice 57. The neck 62 is provided with a flange 63, interfitted in the bearing 64. Lock plates 65 and 66 engage the flange 63 and hold the knob 61 rotatably mounted within the orifice 57.

Within the knob 61, I provide an eccentrically disposed orifice 67, in which is disposed a bearing pin 68, arranged to press against the disk 58, eccentrically thereof. A spring 69 serves to press the bearing pin 68 against the disk 58. A set screw 70 within the orifice 67 may be pressed against the spring 69, thereby to impart variable pressure upon the bearing pin 68. An extension pin 71 on the periphery of the knob 61 facilitates the rotary movement of the knob 61, as well as serving as an indicator, for purposes which will appear hereinafter.

Adjacent the lower branch 41 of the block 37, I mount a pair of arcuate guides 72. The center of the arc of the guides 72 coincides substantially with the axial line through the shaft 33.

With the dop carrier assembly thus far described, I provide a work holder or dop 73, carrying spaced arcuate bearings 74. These bearings are arranged to ride upon the arcuate guides 72. The centers of the arcs of the arcuate bearings 74 and the arcuate guides 72 are coincident.

The work holder or dop 73 is arranged to have the axial line through it radial with the arcs of the guides 72 and the arcuate bearings 74. The arcuate bearings in the form of spaced members straddle the branch 41. In the path of the arcuate bearings 74, I provide an orifice 75 which receives a cross bolt 76, one end 77 of which is provided with a set screw 78, having a conical bearing face 79. The opposite end of the cross member 76 is formed with a set screw 80, having a conical bearing surface 81. Rotation of the set screw 78 or the set screw 80 will serve to engage the arcuate bearings 74, to hold the same in position upon the upper surface of the arcuate guides 72.

It will be observed that the angular position of the work holder or dop may thereby be changed at will, to within a maximum angular position in the vertical direction beyond which facetting would be undesirable. Adequate clearance in relation to the branch 56 is made possible by forming a bevelled corner 82 on this block.

The angular position of the work holder or dop 73 in respect of the turntable or skeif determines the facetting angle with respect to the axial line through the culet and perpendicular to the table of the gem, details of which will be readily understood by those skilled in the art.

Orientation of the work holder about the axial line through the shaft 33 accurately is made possible by my construction. This is done in order more efficiently to present the surface to be worked upon, with due regard to the crystallographic axes of the gem. It is the objective to present the gem with the grain of the surface to be worked on as closely perpendicular to the rotation of the skeif as possible, thereby to secure a rapid rate of polishing, facetting or similar operation.

For this purpose I provide a guide rod 83 which is arranged to lie adjacent the block 43. The guide rod 83 is preferably made of round stock to present a point contact to the vertical face of the block 43. The guide rod 83 is mounted in the standards 12 and 13, respectively, adequate provision being made for adjustment in a horizontal plane by adjusting screw members 84 at one end thereof.

By means of the adjustments of the adjusting screws 84 for the guide rod 83 and the adjustments for the horizontal rod 16, adequate provision is made to assure a truly vertical mounting of the shaft 33 in respect of the worktable or skeif 10. As it becomes necessary to orient the work holder 73 and the gem which it holds, more efficiently to present the grain of the surface to be facetted to the rotation of the work table, the set screw 44 is relieved, permitting orientation of the work holder about the axial line of the shaft 33, while still retaining the vertical position of the shaft as bearing contact of the block 43 and guide rod 83 is constantly maintained.

With a work holder 73 mounted in position and with the work 85 held therein, the procedure is to manipulate the device so that the work 85 just contacts the face 86 of the grinding wheel or skeif. This may be done by manipulation of the set screws 48 and 54. The clearance between the edge 87 of the set screw 54 and the lower face 88 of the branch 38 of the block 37 will determine the depth of the facet by the grinding or polishing operation since the block 37 and the work holder which it carries rest of their own

weight on the face 86 of the worktable or skeif 10.

Variability in pressure upon the work 85 may be effected by means of the knob 61 which resiliently actuates the finger 60 within the groove 51. Rotation of the knob 61 to direct the finger 60 upwardly will increase the pressure on the work to be done. Rotation of the knob 61 to tilt the finger 60 downwardly within the groove 51 will serve to relieve the pressure on the work to be done.

The eccentricity of the bearing finger 68 from the neutral point will increase or decrease the pressure, it being understood that the neutral point will be reached when the pressure finger 68 is aligned with the pin 59.

It will also be understood that varying the pressure upon the set screw 70 will serve to alter the pressure upon the finger 60 and, consequently, increase or decrease the pressure upon the work.

In view of the pivotal mounting of the assembly from the shaft 16, inspection of the work 85 may be accomplished merely by first rotating the nut 54 until the edge 87 bears against the face 88, which will lift the work from the abrading surface. In this position the entire assembly may be rotated forwardly in the position shown in Figure 1, or counter-clockwise, as shown in Figure 2. This disengages the contact of the block 43 from the guide rod 83.

During operation, the radial position of the work in respect of the turntable 10 may be effected by clockwise rotation of the camming element 28 about the pivot point 27. This will serve to prevent grooving of the worktable or skeif.

Selection of the relative position of the blocks 22 and 24 further makes available the working position of the work radially along the face of the skeif.

Finally, upon completion of a facet, wiggling of the camming element to engage the camming surface 31 against the block 20 will serve to oscillate the block 20 back and forth against the spring pressure of the spring 32. Since the camming face 31 varies in radial distance from the pivot 27, rapid wiggling of the member 28 will be valuable in connection with the polishing operation to eliminate any striations in the facetted surface.

The indicator 47 not only is an indication of the depth to cut but is an index to the operator of the effectiveness of the polishing operation—whether it is cutting rapidly or slowly—and is a guide whether or not to increase the pressure by the knob 61, or to make an axial adjustment of the work holder about the axial line through the shaft 33.

The circumferential formation of the facets about the work will more clearly appear in connection with the description of details of the work holder 73, by reference to my Patent No. 2,393,939, of January 29, 1946, for the work holder or dop for polishing the pavillion facets.

Reference is made for details of the work holder or dop, useful in forming the bezel or crown facets to my application Serial No. 500,775, filed September 1, 1943 which became Patent No. 2,449,423, dated September 14, 1948.

In operation, in connection with the formation of the facets on the pavilion or base, one facet is formed and at the completion thereof, the work holder is re-set by turning the cap 133 to the new position.

The work holder illustrated in Figures 1 and 2 is employed to form the bottom corner and pavilion and culet facets below the girdle of the gem, as an initial operation, by the adjustment provided by the arcuate suspension for the work holder 73 and the revoluble adjustment of the work holder within the sleeve 89.

Orientation about the axial line through the vertical shaft 33 has no effect upon the accuracy of the polishing, lapping or brillianteering operation in the forming of the facets.

Upon the completion of the facets below the girdle, a truly pyramidal arrangement of the facets is secured in relation to the axial line through the gem, perpendicular to the table forming portion 127. The gem may thereupon be removed to the dop or work holder for forming the crown or bezel facets.

It will thus be observed that I have provided a new method of gem polishing, or formation of the facets thereon, and novel apparatus for minimizing the labor and unusual skill in connection with the gem polishing or facet forming art, whereby these steps may be performed by semi-automatic procedure. It will also be observed that apart from the features included in utilizing all of the assembly, I have provided apparatus, details whereof have utility independently of the entire assembly, as will be appreciated by those skilled in the art, and accordingly, the invention should be broadly, as well as specifically, evaluated.

It will be observed that where the guide block indicator is in direct bearing contact, proper orientation of the gem during polishing or cutting is evidenced by the needle of the dial, which vibrates during an improper positioning of the diamond, but is stationary and shows the depth of cut during proper orientation.

The subject matter herein is divided from my original application Serial No. 437,056, filed March 31, 1942, now Patent No. 2,393,939, granted January 29, 1946.

Having thus described my invention and illustrated its use, what I claim as new and desire to secure by Letters Patent, is:

1. A machine having a skeif as the polishing surface for cutting, grinding or polishing the facets on diamonds in which a work holding dop carrier is supported over the skeif surface from a horizontal bearing shaft and is adapted to be swung up for inspection of the work contrary to the rotation of the skeif comprising in combination, a bearing block journalled on said shaft and slidable thereon, a vertical pendulous member suspended from said block to be shiftable along said horizontal shaft, stop means intermediate the horizontal shaft and skeif to restrain said dop carrier from being rotated around the horizontal shaft, said pendulous member having a vertical shaft around which said dop carrier is rotatably adjustable to orient the gem and along which the dop carrier may descend under the influence of gravity to contact the diamond with the skeif surface.

2. A machine in accordance with claim 1 wherein the dop carrier block includes means to hold the dop in the adjusted oriented position by contact with the stop means.

3. A device in accordance with claim 1 wherein the dop carrier is connected to a variable spring loaded pressure regulating member and extended to a relatively stationary part of the machine comprising the vertical shaft to augment or par-

tially neutralize the gravitational force in the descent of the dop carrier.

4. A machine in accordance with claim 1 wherein the dop carrier contacts a pressure regulating pin extending into a recess of a relatively stationary part of the machine comprising the vertical shaft, including spring restraining means for said pin, and means to augment or partially neutralize the gravitational force in the descent of the dop carrier acting on said spring means for said pin.

JOSEF HILLEL SPIRA.

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