

Jan. 29, 1957

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2,779,138

MACHINE FOR GRINDING AND POLISHING GEM FACETS

Filed April 28, 1955

3 Sheets-Sheet 1

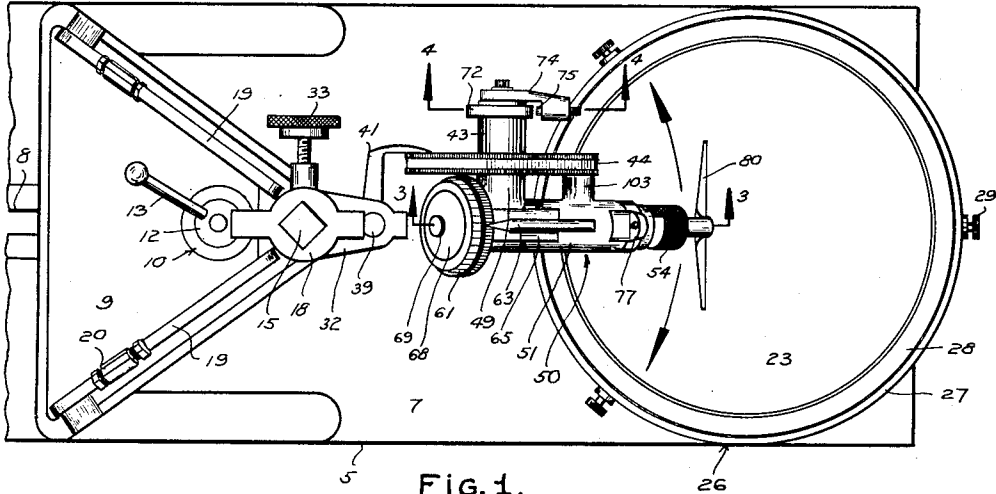


FIG. 1.

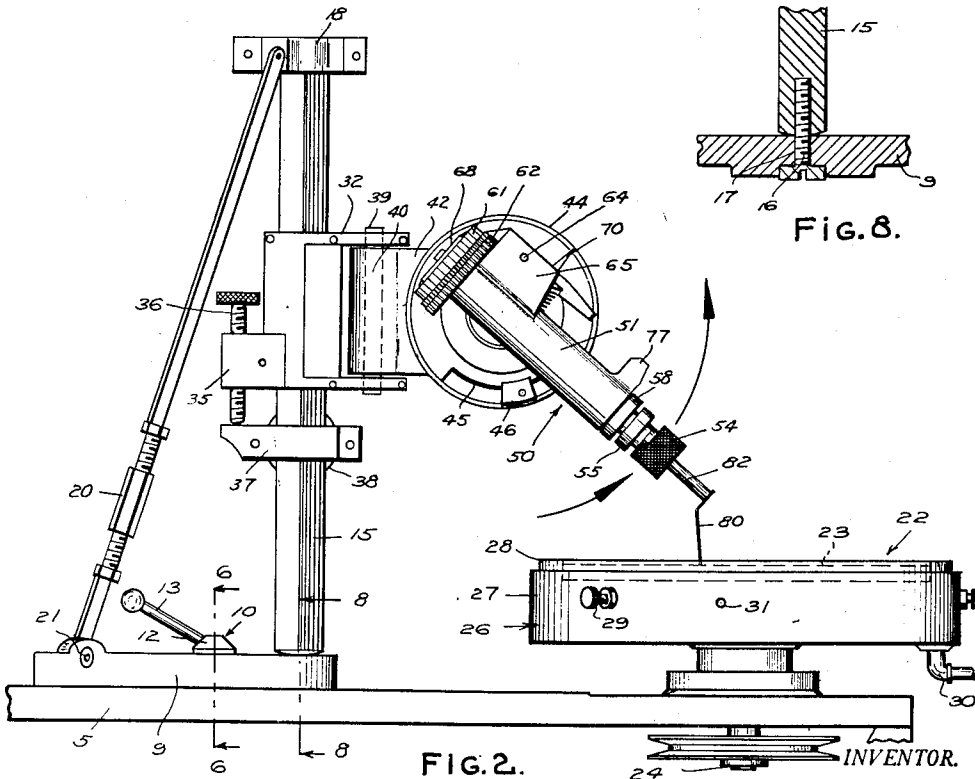


FIG. 2.

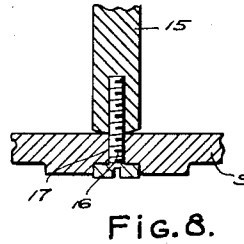


FIG. 8.

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3 Sheets-Sheet 2

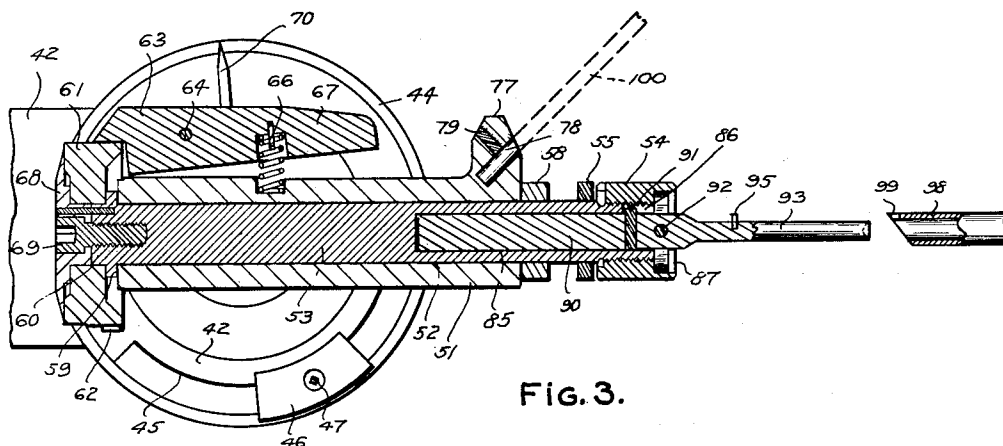


FIG. 3.

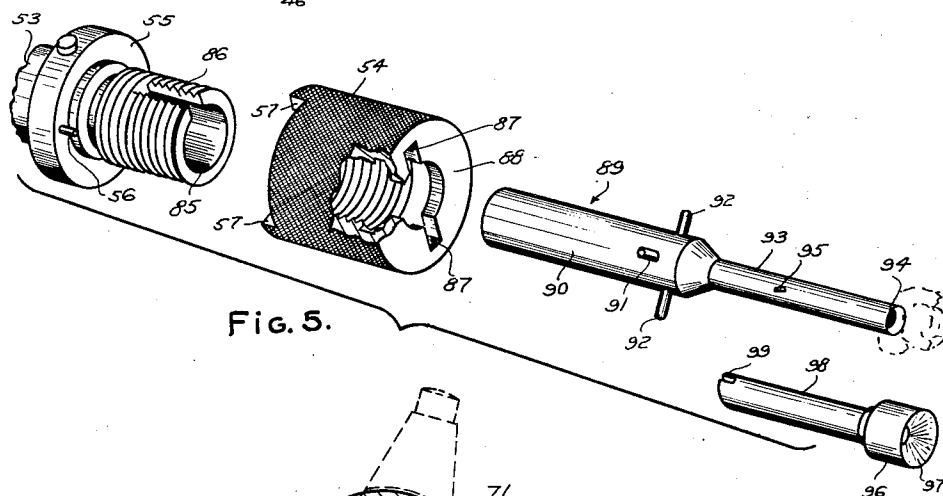


FIG. 5.

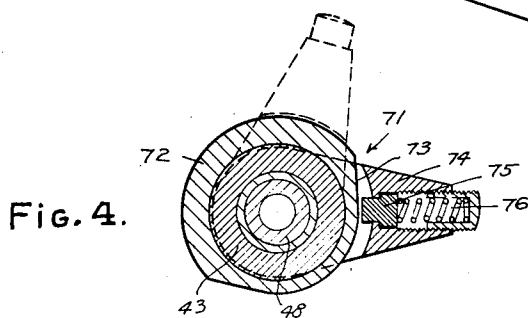


FIG. 4.

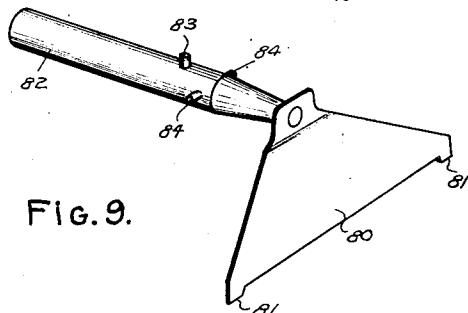


FIG. 9.

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3 Sheets-Sheet 3

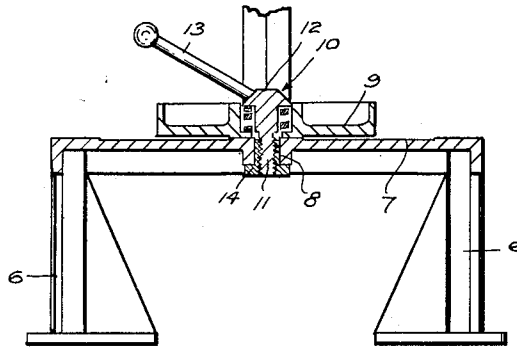


FIG. 6.

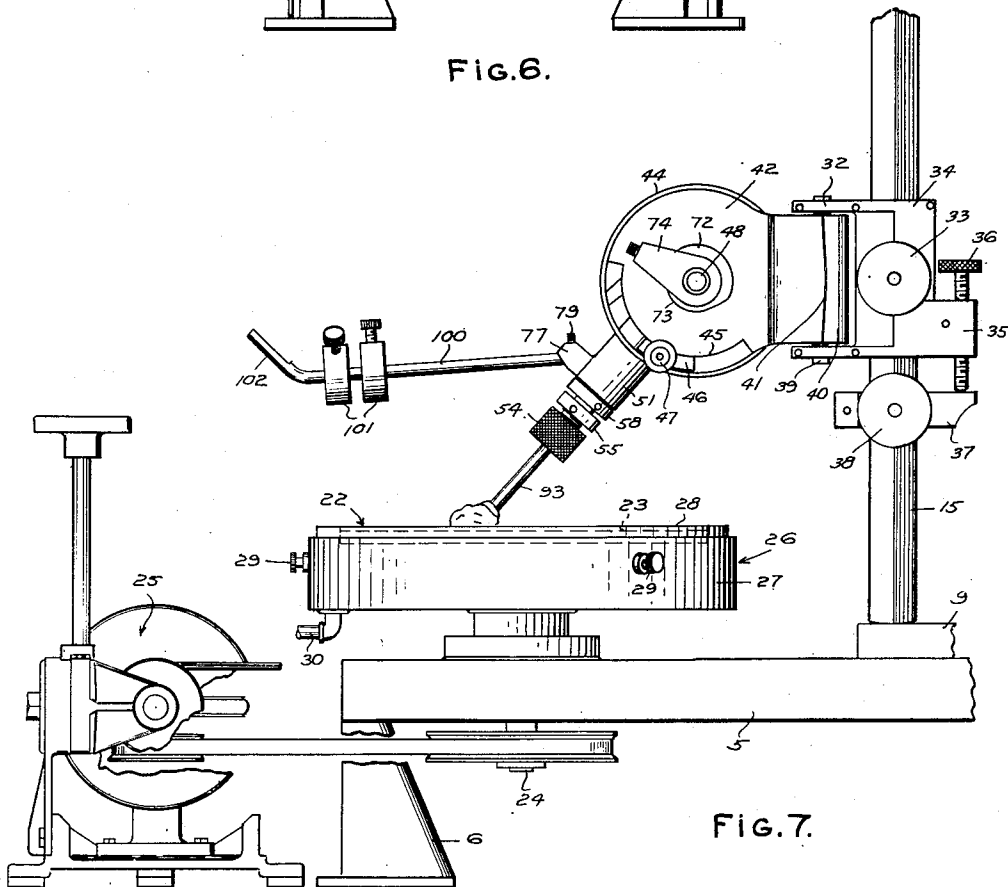


FIG. 7.

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1

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MACHINE FOR GRINDING AND POLISHING GEM FACETS

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Application April 28, 1955, Serial No. 504,399

5 Claims. (Cl. 51—124)

2

This invention relates to a machine for grinding and polishing gem facets.

An object of the invention resides in a machine characterized by a novel assembly of the parts that provides for the grinding of the gem to a high degree of accuracy in a simple and easy manner.

The primary object of the invention is to regulate to a fine degree the angle and spacing of the facets to be cut or being cut on a gem and to assure that all facets similarly positioned about the gem will be of the same predetermined angle to the axis of the gem to the finished product.

Another object of the invention resides in novel adjustable stop means whereby to regulate the degree of grinding of the facets in order to assure that all of the facets will be identical in area and depth.

A further object of the invention resides in a detachable and adjustable weight means whereby to impart a desired degree of pressure between the stone being cut and the lap device.

Still another object of the invention resides in means whereby a gem supporting carriage may be swung upwardly to permit frequent inspection of the gem being ground or for the replacement of another dop and with the carriage being automatically held in the upper position against accidental downward movement likely to damage or displace the supported gem by striking upon the lap wheel.

A further and highly desirable feature of the invention resides in novel alignment means between the carriage and a gem supporting dop whereby to permit the interchange of dops and the ability to replace a dop without altering its original alignment with respect to the carriage.

The above and other objects may be obtained by employing this invention which embodies among its features a vertically adjustable supporting device or yoke wherein is supported a horizontally swingable carriage support to which is attached a protractor and with the carriage being horizontally pivoted for shifting movement in a vertical plane and with the carriage detachably supporting the usual dop, upon which the stone to be ground is supported and with the vertical swinging movement of the carriage being toward and from a lap wheel.

The invention further embodies a novel divider head associated with the carriage whereby the spacing of the facets may be accurately determined.

Other novel features of construction and operation of the device will be clearly apparent during the course of the following description, reference being had to the accompanying drawings wherein has been illustrated a preferred form of the device and wherein like characters of reference are employed to denote like parts throughout the several figures.

In the drawings:

Figure 1 is a top plan view of a device constructed in accordance with the invention,

Figure 2 is a side elevation thereof,

Figure 3 is an enlarged longitudinal section through a carriage device taken on line 3—3 of Figure 1,

Figure 4 is an enlarged section taken on line 4—4 of Figure 1 and illustrating a brake device for retaining the carriage in an upper inoperative position,

Figure 5 is a fragmentary perspective view of a chuck assembly and associated detachable dops,

Figure 6 is a fragmentary transverse section through a clamp device associated with a supplemental base,

Figure 7 is a side elevation from the opposite side of the machine to that illustrated in Figure 2 and with parts omitted,

Figure 8 is a fragmentary vertical section taken substantially on line 8—8 of Figure 2 and illustrating the lower connecting end of a supporting standard, and

Figure 9 is a perspective view of a detachable gauge device.

Referring specifically to the drawings, the numeral 5 designates a rigid and suitably reinforced base member having supporting legs 6. The base member 5 may be cast or fabricated in any desirable manner and from any desirable material, preferably of light weight such as aluminum. The upper surface 7 of the base 5 is longitudinally and centrally slotted at 8 for the slidable and clamping adjustment of a supplemental base plate 9. A clamp 10 of any desirable construction serves to rigidly bind the supplemental base 9 upon the base 5 and this clamp 10, as more clearly illustrated in Figure 6, embodies a screw 11 having a spring loaded head 12 that is rotatable under the influence of a hand crank 13. The screw 11 extends through the slot 8 and is provided with an under-riding nut 14 whereby the supplemental base 9 may be adjusted along the base 5 and with the screw having traverse engagement within the slot 8. The supplemental base 9 is here shown as being triangular in top plan.

Adjustably connected upon the forward portion of the supplemental base 9 is a vertical standard 15, here shown as being square in cross-section. The lower end of the standard 15, as shown more clearly in Figure 8, is slightly rounded to facilitate the adjustability of the standard to a perpendicular position with respect to the bases 5 and 9. A screw 16 passes through an aperture 17 formed within the base 9 and has threaded engagement within a threaded aperture axially formed within the standard 15. It will thus be apparent that by a slight loosening of the screw 16, the standard 15 may be tilted in either direction for a purpose to be presently described. Means are provided to prevent flexing of the standard 15 in either direction with respect to the base 9, comprising an upper head clamp 18 to which is pivotally connected a pair of diagonal brace rods 19 having an adjusting turn-buckle 20 in their lengths. The brace bars 19 are pivotally connected at 21 to the opposite corners of the base 9. It will thus be apparent that the standard 15 may be adjusted to a fine degree and rigidly maintain in such adjustment with respect to the base 9. The standard and associated elements to be presently described may thus be shifted in a horizontal plane toward and from a lap device, illustrated as a whole by the numeral 22 and held in such adjusted position by the clamp device 10. The lap 22 embodies the usual lap wheel 23 that is rotatable in a horizontal plane upon a vertically disposed shaft 24 suitably journaled within the base 5 substantially intermediate its width. The shaft 24 is driven through the medium of a suitable clutch device, illustrated as a whole by the numeral 25. The wheel 23 rotates within and spaced from a cylindrical receptacle 26, rigidly supported upon the base 5 concentric to the wheel 23. The circumferential flange 27 of the receptacle 26 supports a slightly elevated ring

3

28 through the medium of spaced apart screws 29 whereby water dripping upon the wheel 23 will be thrown by centripetal force to fall downwardly within the receptacle 26. A drain coupling 30 serves to conduct excess water from the receptacle 26 as is customary. Overflow openings 31 have been provided in the event that the coupling 30 should become clogged and prevents the elevation of the water to a point where it would overflow and damage the journal bearing for the shaft 24.

Vertically adjustable upon the standard 15 is a yoke 32 having a set screw 33 through the medium of which the yoke may be rigidly clamped in adjusted position upon the standard. The head portion 34 of the yoke is provided with an offset extension 35 that is vertically apertured and threaded for the threaded reception of an adjusting screw 36. The adjusting screw 36 extends through the extension 35 for contacting engagement with an adjustable clamp 37 that is likewise adjustably supported upon the standard 15 and held in adjusted position by a screw 38. In the initial adjustment of the yoke device 32, the screws 33 and 38 are loosened and the head 34 and clamp 37 shifted upwardly to the approximate elevation, at which time the screw 38 is again tightened. The fine vertical adjustment of the yoke 32 is then possible under the influence of the screw 36, and after such adjustment the screw 33 is again tightened. Horizontally swingable within the yoke 32 and upon a pin 39 is a sleeve 40. The sleeve 40 is provided with an outwardly extending and right angularly disposed flange 41, the terminal end of which constitutes a disc 42 having a centrally and horizontally disposed hub 43. A protractor band 44 is circumferentially fixed to the disc 42 by screws or like fastening devices. The disc 42 is further arcuately and circumferentially cut away at 45 for the adjustable sliding movement of a stop device 46, for a purpose to be presently described. The stop device 46 is held in a predetermined position of adjustment through the medium of a clamping screw 47.

Horizontally rotatable within the hub 43 is a shaft extension 48, preferably formed integral with a hub 49 formed upon a carriage, indicated as a whole by the numeral 50. The carriage device includes a barrel 51 that is open throughout its length to form a cylindrical bore 52. The hub 49 is preferably formed integral with the barrel and at a right angle thereto. Rotatable within the barrel 51 is a shaft 53 that is threaded at its lower extended end for the threaded engagement of a chuck sleeve 54. A collar 55 is fixed upon the extended end of the shaft 53 and carries a stop pin 56 for abutting engagement with shoulders 57 carried by the sleeve 54 through the medium of which the sleeve 54 has a limited turning movement. Another stop collar 58 is fixed upon the extended end of the shaft 53 and limits the upward movement of the shaft with respect to the barrel 51. The shaft 53 at its opposite ends is provided with a stop flange 59 that limits the downward movement of the shaft with respect to the barrel 51. The shaft 53 is extended upwardly beyond the flange 59, as at 60, and adjustably supports a divider head 61 that is notched throughout its circumference, as at 62, for the selected engagement of a spring loaded latch member 63 that is pivotally supported at 64 upon a pair of flanges 65, preferably formed integral with the barrel 51. A spring 66 urges the tail portion 67 of the latch 63 upwardly at all times for latching engagement with the notches 62. The friction clamp plate 68 concentric with the head 61 serves to frictionally bind the head 61 against the flange 59. The set screw 69 having threaded engagement axially of the shaft 53 serves to hold the head 61 in accurate adjusted position with respect to the shaft 53 after adjustment. A pointer device 70 carried by the hub 49 serves as an indicator with the protractor 44 to determine the vertical angularity of the carriage 50.

It is desired that the carriage be freely rotatable in a vertical plane within limits and that means be provided

4

whereby the carriage may be rotated to its maximum upward position and held against accidental downward movement during the positioning of the gem supported dops or where the operator wishes to examine the gem being cut. As a means to retain the carriage in the uppermost position, there has been provided a brake device illustrated as a whole by the numeral 71. This brake device includes a collar 72 fixed upon the outer end portion of the hub 43. The collar 72 at one side and upon its bottom has been cut away to form a cam surface 73. An arm 74 is fixed upon an outer extended portion of the shaft 48 and carries a spring loaded brake block 75 that is limited in its movement toward the cam surface 73. Throughout the major swinging movement of the carriage 50, the block 75 is held in spaced relation to the cam face 73. However, when the carriage 50 is swung upwardly to its maximum position, the block 75 engages and rides upon the maximum diameter of the collar 72, and the spring 76 is of sufficient tension to frictionally bind the block 75 upon the collar 72 with sufficient force to prevent the carriage from dropping downwardly accidentally. The barrel 51 at its lower end is provided with an upstanding lug 77 that is diagonally apertured at 78 for the reception of a weight device, presently to be described. A set screw 79 has threaded engagement with the lug 77 as a means to securely clamp the weight device against displacement.

Means are provided to initially adjust the shaft 53 and associated parts with respect to the flat surface of the wheel 23, such means embodying a gauge plate 80 having spaced apart terminal ends 81 that are adapted to simultaneously contact the surface of the wheel 23 for the initial adjustment of the shaft 53. The gauge plate 80 is rigidly connected to a cylindrical rod 82 carrying pins 83 and 84 and with the pins 83 and 84 being at right angle to each other. The rod 82, in the use of this gauge device, is adapted to engage within an axial cylindrical bore 85 of the shaft 53 with the pin 83 engaging a slot 86 formed within the threaded portion of the shaft 53 as a means to accurately position the gauge with respect to the shaft. When engaging the rod 82 with the shaft 53, the pin 83 passes through one of the notches 87 formed within the end flange 88 of the chuck sleeve 54 after which the gauge is rotated one quarter of a turn to align the pins 84 with the notches 87, at which time the gauge is rotated in a reverse manner to cause the pin 83 to engage the slot 86, after which the sleeve 54 is rotated in a clockwise direction to a point of contact with the pin 56 in which position the rod 82 is securely held in axial alignment with the shaft 53. The carriage 50 is then swung downwardly to a point where the ends 81 contact the surface of the wheel 23. Should one end 81 be elevated, the screw 69 is loosened sufficiently to permit the shaft 53 to be adjusted with respect to the head 61 to the point where both ends 81 will simultaneously contact the surface of the wheel. During the adjustment of the shaft 53, the head 61 is held against turning by the engagement of the latch in a predetermined notch of the head. The latch is usually engaged within the notch indicated by the highest graduation of the head 61. The screw 69 is then again tightened and the carriage swung in a horizontal plane as indicated by the arrows in Figure 1 in order to determine whether or not the gauge ends 81 will have perfect contacting engagement with the surface of the wheel at any point. Upon accurate adjustment of the shaft 53, the gauge 80 is removed by reverse movement of the sleeve 54, permitting the rod 82 and its associated pins 83 and 84 to be shiftable outwardly of the chuck.

Now, with the shaft accurately adjusted, the operator engages a master drop, indicated as a whole by the numeral 89 and more clearly illustrated in Figures 3 and 5. The master dop 89 embodies a cylindrical rod 90 having a diameter corresponding to the rod 82 of the gauge device 80. The rod 90 has right angularly disposed pins 91 and

92 that cooperate with the chuck sleeve 54 and the shaft 53 in a manner identical with that just described with respect to the gauge device 80. The master dop is further provided with a cylindrical and reduced extension 93 having its terminal end provided with a preferably conical recess 94. The extension 93 is provided with a relatively small pin 95 that is in alignment with the pin 91. The conical recessed end 94 may support a gem to be ground through the conventional method of cementing the gem to the end thereof, as diagrammatically illustrated in Figure 5. In assembled position of the dop 90, the pin 95 will at all times be extending upwardly. It will be apparent of course that the dop 89 may be employed as the sole means for supporting the stone to be cut and may be removed at will and substituted by other dops. It has been found desirable in many instances where but one master dop 89 is employed to provide other supplemental dops that may be connected at will upon the extension 93 so that the master dop may be supported in operative position and with the supplemental dops being connected thereto at will. The supplemental dops, illustrated in Fig. 5, embodies a relatively large or small cylindrical head portion 96 having its free end conically recessed at 97. The head 96 is provided with an axial tubular extension 98 having its terminal end open and preferably beveled. The end of the sleeve 98 is notched at 99 for interlocking engagement with the pin 95 when the sleeve 98 is shifted over the extension 93, thus assuring that a stone being cemented within the recess 97 may at all times be engaged with the extension 93 to be accurately disposed in its initial grinding position should the supplemental dop and its supported partially ground stone be removed for subsequent replacement. Thus, with the master dop supported upon the carriage in a fixed position with respect to the shaft 53, the supplemental dop permits the operator to remove and replace it at will without disturbing its initial accurate position with respect to the grinding surface of the wheel 23. The operator may by the use of numerous supplemental dops work upon various stones and may at all times select a supplemental dop with a partially ground stone and replace it upon the machine and be assured that it will always assume the same relative position to the grinding wheel. Any desirable means may be employed to hold the supplemental dop in supported engagement with the master dop against accidental displacement such, for instance, as applying a dopping wax over the notched end of the supplemental dop to securely bind the two together.

The operation of the device is as follows:

Assuming that the parts are in the assembled relation, it first becomes necessary that the pin 39 be disposed in an extremely accurate perpendicular position, since the accuracy of the grinding operation is entirely dependent upon a true swinging movement of the carriage. A suitable gauge device (not shown) will be employed to determine the accuracy of the pin 39 with respect to the lap. Should it be necessary to adjust the pin for accuracy, such adjustment is made by the braces 19, through the medium of the turnbuckles 20, tilting the standard 15 and its supported yoke 32. With the pin accurately positioned, the operator then proceeds to accurately set the shaft 53 through the medium of the gauge 80, whereby the shaft and the dops to be supported thereby will be accurately disposed with respect to the grinding wheel 23. With the gauge device 80 in position as illustrated in Figure 2, the carriage 50 is swung downwardly to a point where the gauge ends 81 contact the flat surface of the wheel 23. The mechanism may be swung laterally, as indicated by the arrows in Figure 1, to determine if the gauge ends 81 fully contact the surface of the wheel. Such an adjustment assures that the grinding action upon the stone to be cut will be identical at any point of contact with the wheel 23. After adjustment, the gauge is removed in the manner heretofore described, after which the operator cements a stone to be cut within the conical end of the dop device 89. With the chuck sleeve 54 rotated in an

anti-clockwise direction to a stop position against the pin 56, the rod 90 is then inserted through the cylindrical opening of the flanged end of the chuck 54 to the point where the pin 91 engages through a slot 87. Then, by rotating the rod 90 one quarter of a turn, the pins 92 are then permitted to pass through the slots 87, while the pin 91 enters the slot 86 of the head 61 and, as each facet is ground, the latch is actuated to permit the head 61 to be rotated a distance in accordance with the next facet to be ground. This rotation of the head and the subsequent engagement of the latch 63 therewith assures that the facets will be equidistantly spaced and identically ground, since the maximum grinding action of the facets is determined by the engagement of a stop lug 103 carried by the barrel 51 with the stop device 46 of the protractor. It will therefore be apparent that the degree of grinding to form the facets will be accurately determined by the stop 46, while the spacing of the facets will be determined by the divider head 61. With relatively soft stone, it may not be necessary to employ the weight supporting rod 100. During the grinding of the stone, it is desirable that it be frequently inspected by the operator, and this is accomplished by swinging the carriage upwardly. When a dop is to be replaced, the operator swings the carriage to its uppermost position, at which time the brake device engages upon the collar 72 and is frictionally held in such position under the action of the block 75, preventing the carriage from falling downwardly by gravity and avoiding the possibility of damage to a stone supported by the dop. It is desirable at times that the operator be working upon various stones, and to permit the interchange of dops, he employs a plurality of the supplemental dops 96. In such cases, the supplemental dop 96 is engaged over the shank of the dop 89 to a point where its notched end 99 engages the pin 95 of the dop 89. The dop 96 will thus be accurately aligned with the carriage and may be removed at will and replaced without disturbing such alignment and permits the operator to work at will upon various stones, being assured that they will always engage the grinding wheel at the same predetermined angularity and spacing of the facets. Obviously, this is only true in the event the protractor stop 46 has not been changed as to its setting. However, before removing a dop 96 and a partially ground stone, the setting with respect to the protractor is recorded in accordance with the setting of the pointer 70.

It will thus be observed that I have provided a new method of gem polishing or formation of the facets thereon and a novel apparatus for minimizing the labor and unusual skill in connection with 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. The assembly and relation of parts are relatively simple and easy to adjust and facilitates the accurate degree of grinding action and the predetermined spacing of the facets with a minimum of effort, and provides for a high degree of accuracy in the gem grinding art that permits the average student to grind and polish a gem with a high degree of efficiency.

While in the foregoing there has been shown and described the preferred embodiment of this invention, it is to be understood that minor changes in the details of construction and combination and arrangement of parts may be resorted to without departing from the spirit of the invention as determined by the scope of the subjoined claims.

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

1. A machine for grinding facets upon precious stones that includes in combination, a base having a lap wheel rotatably supported thereon, a standard adjustably supported on the base, a yoke adjustably supported on the standard, a support device that is pivotally supported by

the yoke to swing in a horizontal plane and a carriage that is pivotally supported upon the support to swing in a vertical plane, the support device embodying a disc having a circumferentially fixed protractor and an adjustable stop, a tubular hub formed upon the disc, a shaft carried by the carriage that is rotatable in the hub and with the shaft extending beyond the end of the hub, a brake arm fixed to the extended end of the shaft and a cam collar fixed to the hub, a spring loaded brake block carried by the arm that has frictional engagement with the collar when the carriage is swung upwardly in a vertical plane, the brake block being free of frictional engagement with the collar when the carriage is in a downward position, the carriage including an elongated barrel wherein is rotatably supported a shaft, means formed upon the shaft adjacent one end to prevent sliding movement of the shaft with respect to the barrel in one direction and a collar engaged with the shaft adjacent its opposite end to prevent sliding movement of the shaft in the opposite direction with respect to the barrel, the shaft at one end being slotted and threaded for the reception of a threaded chuck sleeve, the shaft at its opposite end provided with an adjustable divider head co-axial therewith whereby the shaft may be adjustably rotated, friction clamping means whereby the divider head is frictionally held in adjusted position with respect to the shaft, the divider head being circumferentially calibrated and notched, a latch device carried by the barrel and which has a constant spring bias toward the notches whereby to hold the head and the shaft in predetermined degrees of rotation, a stone holding dop having a shank that is engageable with the shaft and held in clamped co-axial relation thereto by the chuck sleeve, the carriage and a supported dop being swivable downwardly to engage a supported stone with the lap wheel, supplemental dops of tubular form that are engageable over the first named dop and having a fixed co-axial relation thereto, a gauge device that is interchangeable with the first named dop whereby to accurately dispose the shaft with respect to the lap and a detachable and adjustable weight device engageable with the barrel whereby to impart a predetermined pressure upon a dop supported stone with respect to the lap.

2. The device according to claim 1, wherein the carriage supported shaft is axially cylindrically recessed inwardly from its threaded end, a master dop having a cylindrical shank that is calculated to have a close sliding engagement within the recess, a pin radial from the shank that has an engagement within the slotted end of the shaft, the said chuck sleeve having a flanged end that is oppositely notched for the passage of a pair of diametrically oppositely arranged pins carried by the shank at a right angle to the first named pin, stop means for limiting the turning movement of the chuck sleeve whereby to progressively engage the several pins into the shaft slot and behind the chuck flange whereby to securely clamp the dop in co-axial alignment with the shaft, the dop provided with a reduced co-axial extension having its end recessed for the cementing support of a stone to be ground, another pin fixed upon the reduced extension, supplemental dops adapted to be supported upon the reduced extension, said supplemental dops embodying a cylindrical head portion and a reduced co-axial tubular extension open at its end and beveled, the open end of the supplemental dops being notched for engagement with the last named pin whereby to hold the supplemental dops in axial alignment with the first named dop and against rotation with respect thereto, the cylindrical head of the supplemental dops being axially recessed for the cementing reception of a stone to be ground, a lug formed upon the barrel adjacent one end and adjacent the chuck and with the lug being diagonally apertured, a weight supporting rod that is engageable within the aperture to be disposed in a forward and upwardly angled position with respect to the barrel, weights adjustably slidable along the rod for determining a predetermined added pressure upon the downward swinging

movement of the barrel in accordance with the hardness of a stone to be shifted into grinding contact with the lap wheel, the rod at one end being angled and also engageable within the aperture for varying the angularity of the rod and a gauge device that is interchangeable with the first named dop, the gauge device comprising a relatively wide head portion having spaced apart contact points adapted to have a simultaneous contacting engagement with the surface of the lap when the carriage supported shaft has been accurately adjusted, the gauge head having a cylindrical shank member corresponding to the shank of the first named dop and with the shank member provided with pins corresponding to the pins of the shank portion of the first named dop whereby the shank of the gauge is clamped in accurate co-axial alignment with the shaft by the chuck sleeve.

3. The device according to claim 1, wherein the first named rotatable shaft for the pivotal support of the carriage extends outwardly from the side of the carriage adjacent one end whereby to overbalance the carriage for a downward swinging movement by gravity and whereby to urge a stone to be ground into pressured contact with the lap.

4. A machine for grinding facets upon precious or semi-precious stones that comprises a rigid elongated base having a lap wheel rotatable thereon adjacent one end and a supplemental base supported thereon adjacent the opposite end, the first named base being longitudinally slotted, clamping means carried by the supplemental base and slidable through the slot whereby to adjustably position the supplemental base toward and from the lap wheel, a perpendicular standard connected to the supplemental base and shiftable therewith, adjustable diagonal braces between the upper end of the standard and the supplemental base whereby to maintain the standard against flexing from a true perpendicular position, a yoke adjustable upon the standard and a carriage device supported by the yoke and whereby the carriage is swivable in a horizontal and a vertical plane toward and from the lap wheel, chuck means carried by the carriage whereby to detachably support a stone carrying dop for movement across the lap wheel and toward and from the lap wheel, friction brake means between the carriage and the yoke whereby the carriage and a supported dop may be elevated and held in a position remote from the lap wheel against movement in a vertical plane, gauge means between the carriage and yoke for accurately determining vertical angularity of the carriage and a supported dop with respect to the lap wheel and a divider head associated with the carriage whereby the dop and a supported stone may be progressively rotated for guiding equidistantly spaced facets upon the stone.

5. The structure according to claim 4, wherein the lower end of the standard is rounded to permit of a rocking movement of the standard under the influence of the braces to a perfect perpendicular position, a set screw that passes through an opening of the supplemental base for axially threaded engagement with the standard and whereby to rigidly fix the standard after adjustment, the said standard being square in cross section and with the braces being provided in their lengths with turn buckles.

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