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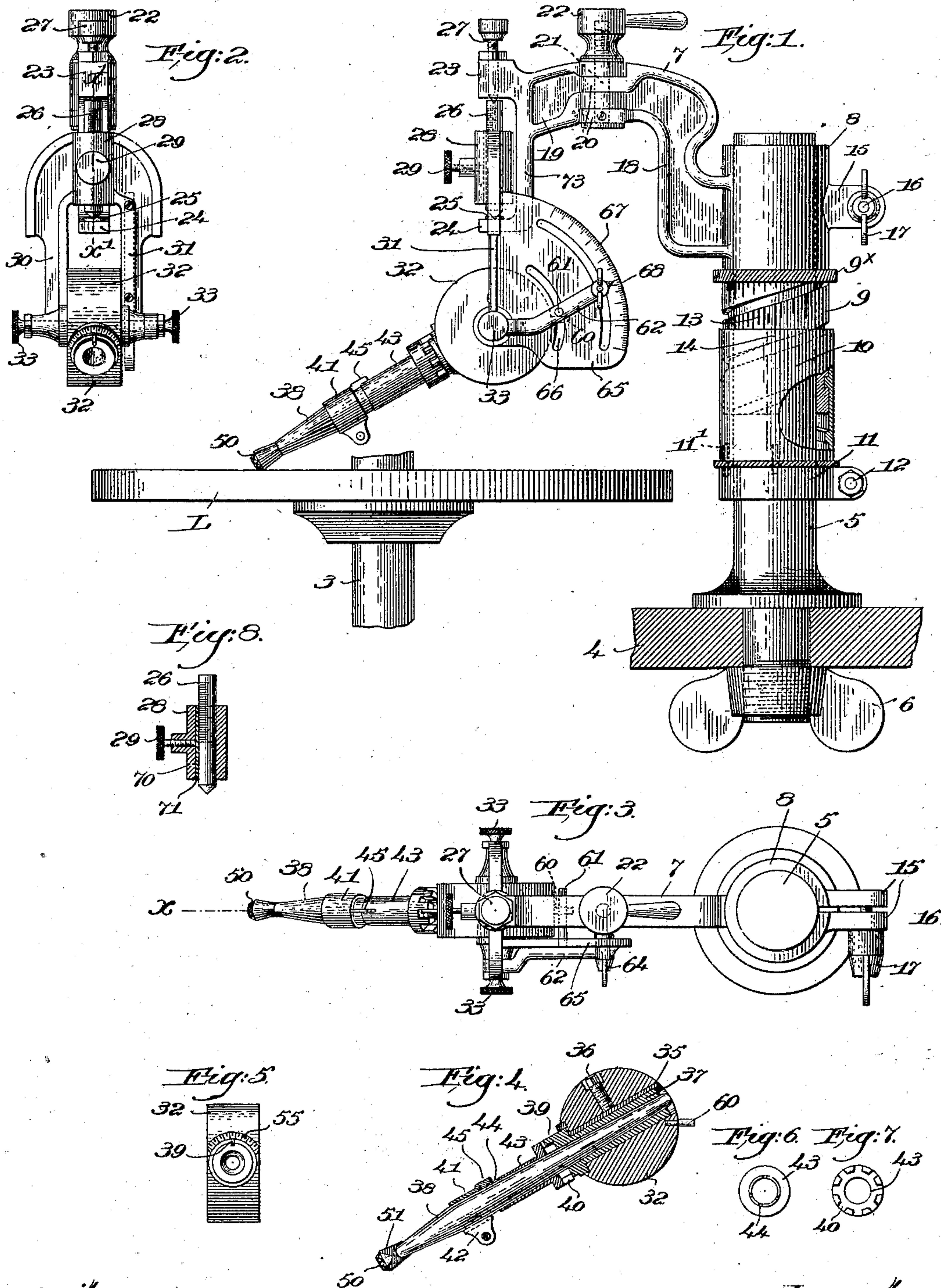
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F. R. KNEIP.

APPARATUS FOR CUTTING AND POLISHING PRECIOUS STONES.

(Application filed Jan. 31, 1901. Renewed Oct. 29, 1901.)

(No Model.)



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UNITED STATES PATENT OFFICE.

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APPARATUS FOR CUTTING AND POLISHING PRECIOUS STONES.

SPECIFICATION forming part of Letters Patent No. 698,521, dated April 29, 1902.

Application filed January 31, 1901. Renewed October 29, 1901. Serial No. 80,461. (No model.)

To all whom it may concern:

Be it known that I, FREDERIC R. KNEIP, a citizen of the United States, residing at Boston, county of Suffolk, State of Massachusetts, have invented an Improvement in Apparatus for Cutting and Polishing Precious Stones, of which the following description, in connection with the accompanying drawings, is a specification, like characters on the drawings representing like parts.

In order to prepare precious stones to be used in rings or other jewelry, it is necessary to cut and polish the same in order to shape the stone with a variety of facets, which are generally arranged in series, and to make a perfect stone each facet of any one series should have the proper angle to the axis of said stone.

One of the common methods which lapidaries have heretofore employed in cutting precious stones consists in setting the stone in suitable wax secured to the end of a "stick" and then holding the stone against the revolving lapidary's wheel, or "lap," as it is termed, by means of the stick, the pointed end of the stick being supported in a suitable recess in a rest or support adjacent to the lap, the said rest serving to hold the stick at the proper inclination to the wheel or lap. In this method of grinding the stone, however, the angle that the stick should be turned on its axis after one facet has been ground in order to present the stone in the proper position to the lap to grind the next facet is determined entirely by the skill and judgment of the lapidary or operator, and hence to grind a stone having perfect facets requires exceedingly great skill in the lapidary.

Various mechanical devices have been devised to assist the lapidary in more perfectly grinding the stone, and it is the object of my invention to provide a simple device of this character which will insure that the stick shall be supported at the proper inclination to the lap to grind the facets at the correct angle and also which shall operate to positively position the stick angularly about its axis, so that the separate facets in any row of facets will be ground at equal distances apart and at exactly the same angle to the axis of the stick. I have also provided means

for varying at will the inclination of the stick to the lap, so that it is possible to grind two or more series of facets upon a stone at different angles to the axis of the stone or stick. 55

To accomplish these objects, my invention comprises for use in connection with a suitable revolving wheel or lap an overhanging arm or support, from which is suspended a stick-holder adapted to hold the stick, to which the stone is attached in the usual way, said stick-holder being mounted for movement about both a vertical and a horizontal axis. A stick-holder has a suitable tapering socket, in which the tapering end of the stick is received, and suitable means are employed for interlocking the stick and stick-holder to properly position the stick angularly about its axis. 60

The specific structure in which I have chosen to embody my invention comprises a vertically-adjustable arm or support, to the end of which is pivoted a head-block to move about a vertical axis, said head-block having pivoted thereto to move about a horizontal axis a stick-holder having a socket to receive the end of the stick to which the stone to be ground is affixed. The horizontal axis about which the stick-holder turns is situated in the same vertical plane as the vertical axis of the head-block and is directly beneath the pivotal support of the head-block, whereby an absolutely universal movement of the stick-holder is secured, and the adjustable arm or support may be lowered until the stick-holder is nearly parallel with the face of the lap without any of the supporting parts of the stick-holder striking the lap. The stick has adjustably secured thereto a two-part sleeve, one part of which is in the nature of a thimble and may be adjusted about the axis of the stick relative to the other, and the adjustable portion of the sleeve has a series of recesses in its end, which cooperate with an adjustable projection upon the stick-holder, so that by withdrawing the stick slightly from the holder and turning the same about its axis any one of the recesses in the thimble may be caused to engage the projection on the stick-holder, thus insuring the proper positioning of the stick angularly about its axis, and consequently the grinding 70 75 80 85 90 95 100

of the various facets at equal distances apart. By raising or lowering the vertically-adjustable arm or support the inclination of the stick to the lap may be changed, and by changing the relation between the two parts of the sleeve on the stick a second series of facets may be ground upon the stone, each facet of the second series having the same angle to the axis of the stone, but a different angle from the facets of the first series.

I may also, if desired, provide means whereby the stick-holder may be vertically adjusted with relation to the arm or support, and by this means I can change the angle of inclination of the stick to the lap without changing the position of the arm or support. This is important, for where a whole series of stones are being ground in the same stick-holder it sometimes happens that the sticks used will be of slightly-different lengths, which results in the facets of different stones being ground at different angles. By means of the vertical adjustment of the stick-holder I can insure that the various sticks shall always have the same angle of inclination to the lap, even though they vary in length.

Referring to the drawings, Figure 1 is a side elevation of my device complete. Fig. 2 is a front view of the device with the stick removed. Fig. 3 is a top plan view. Fig. 4 is a section of the stick-holder on the line x , Fig. 3. Fig. 5 is a front view of the stick-holder. Figs. 6 and 7 are detailed views of the thimble on the stick; and Fig. 8 is a partial section on line $x'x'$, Fig. 2.

The polishing-wheel or lap is designated by L, this being of any suitable construction and being mounted for rotation upon the vertical shaft 3.

4 designates a portion of the bench or table adjacent the wheel, to which is secured in any suitable way the post or standard 5, said post or standard extending through the bench or table and being clamped thereto by the winged nut 6.

The arm or support which carries the stick-holder is designated generally by 7, and said arm has at one end the hub or sleeve 8, which is sleeved over the post 5 and is vertically adjustable thereon, as hereinafter described. As illustrated, the hub 8 of the arm 7 is supported upon an extensible collar, which in turn rests on a split stop-collar 11, which is clamped to the post in any desired position by means of the bolt 12 in the usual way. The extensible collar comprises the exteriorly-screw-threaded bushing or collar 9, which is loosely sleeved over the post 5 and which is provided with the milled portion 9^x, by which it may be turned, and the sleeve 10, having the interior screw-threads to fit those on the collar 9 and fixedly secured to the stop-collar 11 by means of pins 11', which project from the said collar into the lower end of the sleeve 10, as seen in dotted lines in Fig. 1.

Preferably the screw-threaded collar 9 will be provided with suitable graduations, as 13,

and the sleeve 10 will be provided with the mark 14, which coöperates with the graduation 13, the purpose of the graduations being to guide the lapidary in adjusting the arm 7 to the proper height in order to grind facets at a predetermined angle, for it will be obvious that by having the graduation-marks 13 properly labeled in terms of angles when the lapidary desires to grind facets on a stone at an angle of, say, forty-five degrees he will merely have to turn the collar 9 until the forty-five-degree mark registers with the mark 14 on sleeve 10 and then lower the arm 7 till its hub 8 rests on the collar 9. In order to grind facets at any other predetermined angle, he will merely have to turn the collar 9 up or down to bring the mark indicating the desired angle into register with mark 14 and bring the hub 8 of arm 7 down onto said collar 9, when the said arm 7 will be properly adjusted to grind the facet at the correct angle. In order to hold the said arm from turning after it has been adjusted to the proper height, I preferably split the hub 8, as shown in plan in Fig. 3, and provide the same with the lugs or ears 15, through which the clamping-bolt 16 passes, upon which is mounted the winged nut 17, this operating as a simple clamping device.

The arm 7 is preferably jointed intermediate its length, the two parts 18 and 19 thereof having the eyes 20, through which the pivot-bolt 21 passes, the upper end of the bolt having the clamping-nut 22 thereon, whereby the two parts may be rigidly clamped together when adjusted into the proper position. The outer end of the portion 19 of the arm has the stick-holder pivoted thereto for movement about both a vertical and a horizontal axis, one good way of doing this being to pivot to the end of said arm for movement about a vertical axis a head-block, to which in turn the stick-holder is pivoted to move about a horizontal axis, the horizontal axis of the stick-holder being directly underneath the vertical axis of the block. To accomplish this, I provide the end of the arm with the offsets 23 24, the offset 24 having the socket 25 therein, in which sets the pointed end of the pivot-pin 26, the upper end of said pin having a socket, in which sets the pointed end of the set-screw 27. The pivot-pin 26 is therefore mounted to turn about a vertical axis, and adjustably secured thereon is the head-block 28, said head-block being sleeved over the pivot-pin 26, as shown, and provided with the set-screw 29 for clamping it in any adjusted position.

As illustrated in Fig. 8, the head-block 28 is provided with a longitudinal groove 70 directly underneath the set-screw 29, in which groove is fitted a spline 71, which rests against the smooth exterior surface of the pin 26 and against which the set-screw 29 bears, the purpose of said spline being to obtain an even bearing on the pin 26 and prevent the end of the screw 29 from engaging

the same. Preferably the inner surface of the spline 71 will be slightly concave to fit the convex exterior of the pin 26.

Preferably the pivot-pin 26 will be provided with suitable graduations, so that the exact height of the head-block upon the pin may be known.

Depending from either side of the head-block are the arms 30 31, in the lower end of which is mounted for movement about a horizontal axis the stick-holder proper, 32, the said stick-holder being shown as a short cylindrical body having central of its ends suitable sockets, in which are seated the pointed ends of pivot-screws 33, supported in the lower end of the arms 30 31, as shown in Fig. 2. The stick-holder 32 therefore can turn about its horizontal axis in the arms of the head-block, and by swinging the head-block about its vertical axis the stick-holder has also movement about the same vertical axis, the stick-holder being therefore mounted to move about both a horizontal and a vertical axis.

Referring to Fig. 1, it will be seen that the horizontal axis of the stick-holder in the head-block is in the same vertical plane as the vertical axis of the head-block, so that the vertical axis about which the stick-holder moves intersects the horizontal axis, whereby the stick-holder is capable of a universal movement about a fixed center of motion. Furthermore, the point of intersection between the vertical axis of the stick-holder and the horizontal axis thereof is on the axis of the socket in the stick-holder, so that when the stick is inserted in the stick-holder the fixed center of motion of the stick-holder, which is the point of intersection between the vertical and horizontal axis thereof, is in the axial line of the stick. Hence the stick itself has a universal movement about a fixed center of motion. By constructing the head-block with the depending arms the pivotal point of the stick-holder in the arms is brought below the pivotal support for the head-block, so that the arm 7 may be so adjusted as to bring the stick-holder nearly parallel with the face of the lap without any portion of the support thereof striking the lap.

From the above it will be seen that the stick-holder is suspended from the arm 7, so that the said arm 7 is in the nature of an overhanging arm, from which the stick-holder is suspended and to which it is pivoted for movement about both a vertical and a horizontal axis.

My invention, therefore, in its broadest sense comprises an overhanging arm having the stick-holder suspended therefrom in such a manner as to be capable of movement about these two axes, and while I have above described one way in which this may be accomplished, yet it will be obvious that the end might be secured in other ways than that illustrated.

The stick-holder is provided with a taper-

ing socket, and the end of the stick which is inserted into said socket is also tapered, so as to fit the tapered socket, and thus hold the stick steadily during the grinding operation.

To prevent the stick from turning about its axis after it has been inserted into the socket, the stick-holder carries suitable means which engages corresponding means secured directly to the stick-holder intermediate or between its ends, whereby the stick-holder and stick are interlocked together. The interlocking connection, which is situated between the ends of the stick-holder, is of such a nature that when the stick is withdrawn from the stick-holder the interlocking connection is broken, after which the stick may be turned about its axis and again inserted into the socket, when the interlocking connection operates to lock the stick against rotation and also to give it a definite angular position—that is, a definite position about its own axis—whereby after grinding one facet the stick may be readily brought and held into the proper position for grinding the next facet. This result may be accomplished in various ways, and the drawings show the best manner now known to me for securing these ends.

Looking at Fig. 4, it will be seen that the stick-holder is provided with a transverse cylindrical socket, in which is removably mounted a socket-piece or sleeve 37, said sleeve having an aperture to fit the end of the stick 38, and, as shown, the end of the stick is tapering, and therefore the sleeve 37 has a corresponding tapered opening. The sleeve or socket-piece 37 is held in place by means of a set-screw 36, which bears at its inner end against a spline 35 similar to spline 71, above described, the said spline 35 being seated in a groove in the stick-holder and having its inner face concave to fit the convex outer surface of the socket-piece 37. I will also preferably make the said spline with a slight longitudinal convexity, so that when in place, with the set-screw 36 bearing thereon, the pressure thereof on the socket-piece or sleeve 37 will be uniform throughout its entire length.

The means for interlocking the stick with the stick-holder in order to angularly position the stick during the grinding operation comprises a suitable projection on one of said parts which is adapted to engage any one of a series of recesses or notches in the other of said parts, and in the drawings I have shown the outer end of the sleeve as provided with a projection 39, said projection cooperating with any one of a number of notches or recesses 40, which are carried by the stick intermediate its ends, the said notches being shown as formed in the end of a two-part sleeve, which is adjustably secured to the stick 38, the said two-part sleeve being illustrated as comprising the split band 41, which is clamped to the stick by means of a clamping-bolt passing through the lugs 42 thereon and the thimble 43, which is provided at one

end with a series of slits 44 to engage a fin 45 on the band 41 and at the other end is provided with the recesses 40, before referred to.

The stone is shown at 50 in Fig. 4, and this is secured to the end of the stick 38 by means of the wax 51, as usual in this art.

From this description it will be seen that, supposing there are eight recesses 40 at equal distances apart in the end of the thimble 43, by inserting the stick into the socket-piece or sleeve 37, so that the projection 39 engages one of the recesses 40, and by adjusting the arm 7 to the proper height the lapidary may swing the stick down into contact with the lap L and grind one facet on the stone 50. When this facet has been properly ground, by simply withdrawing the stick slightly from the stick-holder and turning the same about its axis until the next adjacent recess is in line with the projection 39 and then reinserting the stick in the stick-holder a second facet may be ground which has the same angle to the axis of the stick as the first facet, and by continuing this process a series of eight facets will be ground upon the stone, each of which will not only have the same angle to the axis of the stick, but will also be of the same size—that is, spaced equal distances apart angularly. When the first series of facets has been ground, the stick will be removed from the stick-holder and the thimble 43 removed from the band 41 and turned upon the stick so as to bring one of the other recesses 44 into alinement with the fin 45, and if the second series of facets is to be ground at a different angle to the axis of the stone or stick either the arm 7 or the head-block 28 will be raised or lowered, when the grinding operation will proceed as before, the second series of facets being ground intermediate the first series and at a different angle. It will thus be seen that by providing a series of thimbles 43, each having a different number of recesses 40 and a different number and arrangement of slots 44, the same device may be used for grinding stones into a great variety of shapes and always with the assurance that the various facets will be absolutely and accurately ground and at the correct angle.

I may, if desired, provide the stick-holder 32 with the scale 55, with which the projection 39 upon the socket-piece 37 coöperates, so as to insure that the said socket-piece is inserted in the stick-holder in the correct position. I may also use this device instead of the removable thimble 43 for obtaining a second series of facets at a different angle from or intermediate the first series of facets, for after grinding one series of facets the sleeve 37 may be adjusted in the socket about a certain angle, to be measured by the scale 55, when the second series of facets will, of course, be ground at a different angle.

It should be here remarked that, preferably, set-screw 36 will be so adjusted that the friction between the spline 35 and the socket-piece or sleeve 37 will be sufficient to hold the

said socket-piece from turning under ordinary conditions; but by the application of a certain amount of force it may be turned into any desired position.

In order that all of the facets may be ground to exactly the same size, I have provided a suitable adjustable stop device for limiting the downward swinging movement of the stick 38, which will insure in grinding the series of facets that the stick will always assume the same inclination during the grinding operation. This adjustable stop comprises the pin 60, secured in the stick-holder 32, which coöperates with an adjustable stop, as 61, carried by the swinging arm 62, said arm being pivoted upon one of the pivot-screws 33 and having at its free end a clamping-nut 64, which engages a bolt passed through the said arm and a slot in a guide-plate 65, which is secured to the depending arm 31. A slot 66 is also provided in which the stop-pin 61 may operate. With this construction it will be seen that the stop-pin 60 by engaging the stop-arm 61 will prevent the stick from being depressed below a certain predetermined position, and for the guidance of the lapidary I preferably provide the plate 65 with a series of graduation-marks 67, with which a pointer 68 on the end of the arm 62 coöperates.

In using my improved device the collar 9 will be adjusted properly, as above described, to grind the facets at the desired angle, and the arm 62 will also be set to indicate the same angle. The lapidary will then insert the stick in the stick-holder and proceed with the grinding, the stop 60 acting to limit the downward movement of the stick, and thus insuring that the facet will be of the correct size and absolutely at the correct angle. After one series of facets has been ground the thimble 43 may be adjusted, as above described, and either the head-block 28 or the entire arm 7 raised and the arm 62 properly adjusted, when a second series of facets may be ground intermediate the first series and at a different angle. These operations may be repeated until the stone is ground into the desired shape. The universal joint between the stick-holder and arm or support enables the lapidary to give to the stick as free a movement as possible, which is highly essential in this art, and yet at the same time the stick is positively positioned angularly, so that the facets will necessarily be ground correctly.

In some cases it is desirable to use only a certain portion of the surface of the lap—as, for instance, the outside edge thereof—in which case the lapidary will loosen the nut 16 and swing the arm 7 on the post 5 away from the lap and clamp the same in position, when the stick-holder may be swung about its vertical axis toward the lap, its inward movement being limited by the arm 30 striking the head 73. When thus adjusted, the grinding will all be done on the outside portion of the lap.

If it is desired to present the stone to the lap in different directions, the portion 19 of the arm 7 may be adjusted relative to the portion 18 so that the stick may point in any desired direction with reference to direction of movement of the surface of the lap.

In case a series of stones are to be ground with facets at the same angle and the sticks vary slightly in length such variation may be corrected by the vertical adjustment of the head-block 28, as will be readily understood.

From the above description it will be seen that I have provided a device comprising an overhanging arm or support from which is suspended and to which is pivotally mounted, both for movement about a vertical and a horizontal axis, a stick-holder adapted to receive the end of a stick, and suitable means are provided for angularly positioning the stick about its own axis and for holding the same in such correct angular position during the grinding operation, whereby the facets may be ground accurately and evenly.

It will be obvious to those skilled in the art that various changes may be made in the structure of the device without departing from the spirit of my invention, and I therefore reserve the right to make such changes as come within the scope of the appended claims.

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

1. In an apparatus of the class described, an overhanging arm or support, a stick-holder suspended therefrom and pivoted thereto for movement about both a horizontal and a vertical axis, said stick-holder having means to hold the stick from turning.

2. In an apparatus of the class described, an arm or support, a head-block pivoted thereto to move about a vertical axis, a stick-holder pivoted to said head-block for movement about a horizontal axis, said horizontal axis being in line with and vertically underneath the pivotal support of the head-block, said stick-holder having means for supporting a stick, and means to position the stick angularly about its axis.

3. In an apparatus of the class described, a stick-holder pivoted to move about both a vertical and a horizontal axis, said stick-holder having a socket adapted to receive the end of a stick, a thimble secured to the stick intermediate its ends, said thimble having means to interlock with the stick-holder whereby the stick may be positioned angularly about its axis.

4. In an apparatus of the class described, an arm or support, a vertically-adjustable head-block pivoted thereto for movement about a vertical axis, a stick-holder pivoted to said head-block to move about a horizontal axis, said horizontal axis being in line with and vertically beneath the pivotal support of the head-block, said stick-holder having a socket adapted to receive the end of a stick, and

means to position the stick angularly about its axis.

5. In an apparatus of the class described, a vertically-adjustable arm or support, a vertically-adjustable stick-holder pivoted thereto for movement about both a vertical and a horizontal axis, said stick-holder having a socket adapted to receive the end of a stick, a thimble secured to the stick intermediate its ends said thimble having means to interlock the same with the stick-holder.

6. In an apparatus of the class described, a stick-holder pivoted to move about both a vertical and a horizontal axis, and having a socket adapted to receive the end of a stick, a thimble secured to the stick intermediate its ends one of said parts having a series of radial recesses, and the other of said parts having a projection to engage said recesses, whereby the stick may be turned axially and held in any adjusted position to grind the facets.

7. In an apparatus of the class described, a stick-holder pivoted to move about both a vertical and a horizontal axis, and having a socket adapted to receive the end of a stick, a thimble secured to the stick intermediate its ends, said thimble having at one end a series of radial recesses, an adjustable projection on the stick-holder to engage said recesses when the stick is inserted in the stick-holder, whereby the stick may be turned about its axis, and held in any adjusted position.

8. In an apparatus of the class described, a stick-holder pivoted to move about both a vertical and a horizontal axis, and having a socket adapted to receive the end of a stick, a two-part sleeve adjustably secured to the stick intermediate its ends, one of the parts of said sleeve being adjustable about the axis of the stick relative to the other, and having at one end a series of radial recesses, a projection on said stick-holder to engage said recesses, whereby the stick-holder may be turned about its axis and held in any adjusted position.

9. In an apparatus of the class described, a vertically-adjustable stick-holder pivoted to move about both a vertical and a horizontal axis, said stick-holder having a socket adapted to receive the end of a stick, a sleeve or thimble secured to the stick intermediate its ends, said thimble having at one end a series of radial recesses, a projection on said stick-holder to be engaged by said recesses, whereby by turning the stick about its longitudinal axis the facets are positioned, and by the vertical adjustment of the stick-holder the facets may be made at different angles to the axis of the stick.

10. In an apparatus of the class described, an approximately horizontal arm mounted for swinging movement about a vertical axis, said arm being jointed intermediate its ends and having a stick-holder pivoted thereto for movement about both a vertical and a hori-

zontal axis, said stick-holder having means to angularly position the stick about its axis.

11. In an apparatus of the class described, a post or standard, an arm vertically adjustable thereon, said arm having a hub sleeved over said post, an extensible collar upon which the hub rests, a stop-collar on the post supporting the extensible collar, combined with a stick-holder pivoted to the end of the arm for movement about both a vertical and a horizontal axis.

12. In an apparatus of the class described, a post, a stop-collar thereon, a sleeve secured to said stop-collar and having interior screw-threads, a rotatable bushing having exterior screw-threads engaging those of the sleeve, and an arm having a hub sleeved over said post and resting on said bushing, combined with a stick-holder pivotally mounted on said arm, the construction being such that by turning the bushing the height of the arm may be adjusted.

13. In an apparatus of the class described, a post or standard, an arm having a hub sleeved over said post, a rotatable bushing on the post upon which said hub rests, said bushing having a sleeve screw-threaded thereon, whereby the said bushing may be made extensible, an adjustable stop-collar on the post upon which the sleeve rests, the extensible bushing providing means for controlling the height of the arm, combined with a stick-holder pivoted to the arm to move about a vertical and horizontal axis, said stick-holder having means to receive the end of a stick and to position the stick angularly about its axis.

14. In an apparatus of the class described, a vertically-adjustable arm or support, a head-block pivoted to the end thereof to move about a vertical axis, a stick-holder pivoted to said head-block to move about a horizontal axis, said stick-holder having a socket to receive the end of the stick, and having means to position the stick angularly about its axis to form the various facets.

15. In an apparatus of the class described, an arm or support, a head-block pivoted to said arm to move about a vertical axis, said head-block having depending arms, a stick-holder pivoted to the said depending arms of the head-block to move about a horizontal axis, said stick-holder having a socket to receive the end of a stick, and having means to position the stick angularly about its axis to grind various different facets, said head-block having an adjustable stop-arm, and said stick-holder having a pin adapted to engage said arm to limit the downward movement of the stick.

16. In an apparatus of the class described, a stick-holder mounted for movement about both a vertical and a horizontal axis, said stick-holder having a socket provided with an adjustable socket-piece which is adapted to receive the end of a stick, said socket-piece having means to angularly position the stick about its axis, and a scale on the stick-

holder cooperating with the socket-piece whereby the correct angular position of the socket-piece in the stick-holder may be determined.

17. In an apparatus of the class described, a stick-holder mounted for movement about both a horizontal and a vertical axis, said stick-holder having a socket provided with an adjustable socket-piece which is adapted to receive the end of a stick, a sleeve or thimble on said stick, said thimble and socket-piece having engaging means to position the stick angularly about its axis, and means to determine the correct angular position of the socket-piece in the stick-holder.

18. In an apparatus of the class described, an arm or support, a head-block pivoted thereto to move about a vertical axis and having depending arms, a stick-holder pivoted to said depending arms to move about a horizontal axis, said stick-holder having means to hold a stick and position it angularly about its axis, said head-block having an adjustable stop-arm pivoted thereto and a scale with which said arm cooperates, and a stop-pin on the stick-holder adapted to engage said arm and limit the downward movement of the stick.

19. In an apparatus of the class described, an arm or support, a stick-holder pivoted thereto to move about both a vertical and a horizontal axis, said stick-holder having a socket adapted to receive the end of a stick, the vertical and horizontal axis of the stick-holder intersecting each other and the point of intersection being on the axial line of the socket whereby the stick supported in the socket may be swung in any direction about a fixed center of motion.

20. In an apparatus of the class described, an overhanging arm or support, a stick-holder suspended therefrom and pivoted thereto for movement about both a horizontal and a vertical axis, said stick-holder having means to hold the stick from turning, and stop devices to limit the movement of the holder about its horizontal axis.

21. A stick adapted to carry a stone at one end, and tapered at its other end, said stick presenting between its ends a series of notches, the number of notches in the series corresponding with the number of facets to be cut in one round of cuts, a pivoted stick-holder having a tapered socket to receive the tapered end of the stick, and a portion cooperating with said notches to restrain the rotation of the stick about its axis while a facet is being ground, said socket receiving and sustaining the stick yet permitting said stick to be freely withdrawn therefrom after the stone has been cut, that another like stick may be inserted in the socket.

22. A stick having one end tapered and adapted to carry a stone at its other end, a pivoted stick-holder having a tapered socket to receive the tapered end of the stick, one of said parts having a series of notches and the

other a projection adapted to cooperate therewith, said notches and projection being situated between the ends of the stick and serving to hold the stick from turning during the grinding of the facets, the construction being such that the stick may be freely withdrawn from its socket after the stone has been cut, and another like stick inserted in said socket.

23. A stick having one end tapered and adapted to carry a stone at its other end, a pivoted stick-holder having a tapered socket to receive said tapered end of the stick, said stick and stick-holder having interlocking devices situated between the ends of the stick, said interlocking devices serving to hold the stick from turning during the grinding of the various facets on the stone, the construction being such that the stick may

be freely withdrawn from the socket after the stone has been cut, and another like stick inserted in said socket.

24. A stick-holder having a socket-piece to receive the tapered end of a stick, and means whereby the socket-piece may be turned about its longitudinal axis in the stick, to thereby provide for increasing the number of facets which may be cut on the stone carried at the end of the stick.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

FREDERIC R. KNEIP.

Witnesses:

GEO. W. GREGORY,
AUGUSTA E. DEAN.