Aug. 14, 1945. E. ROTHAUSER 2,382,099

DIAMOND POLISHING AND GRINDING DEVICE

Filed May 1, 1942 2 Sheets-Sheet 1

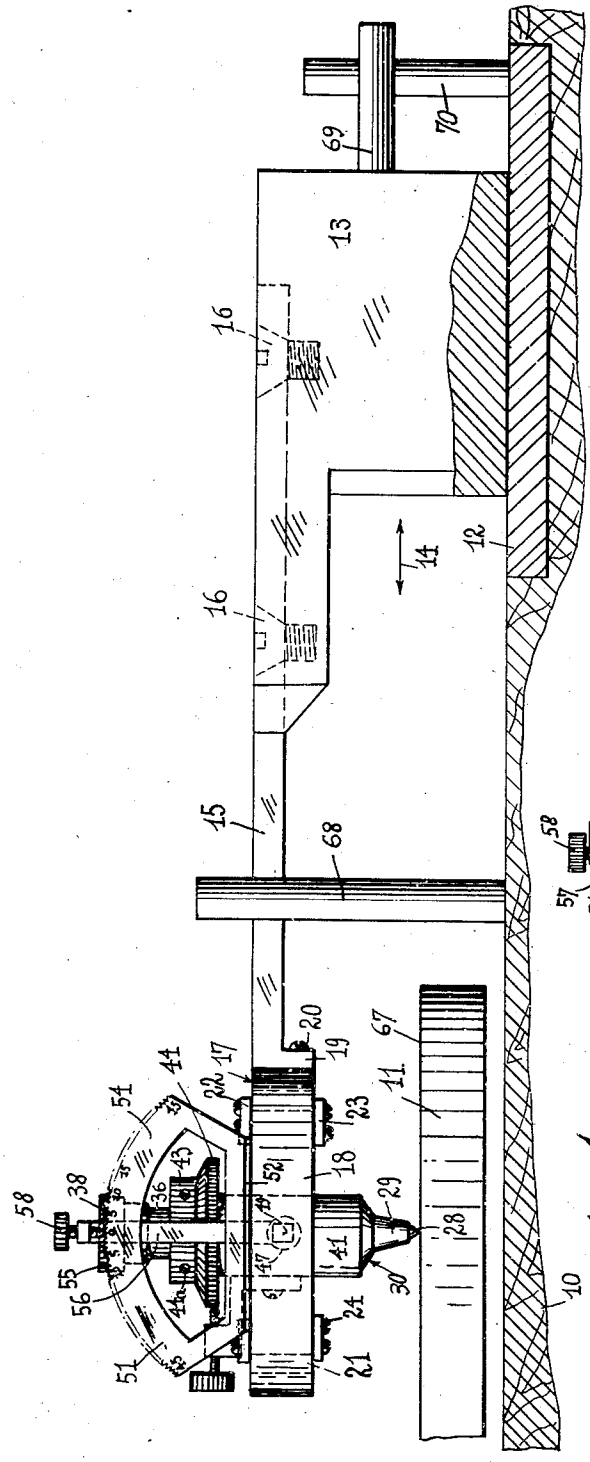


Fig. 1.

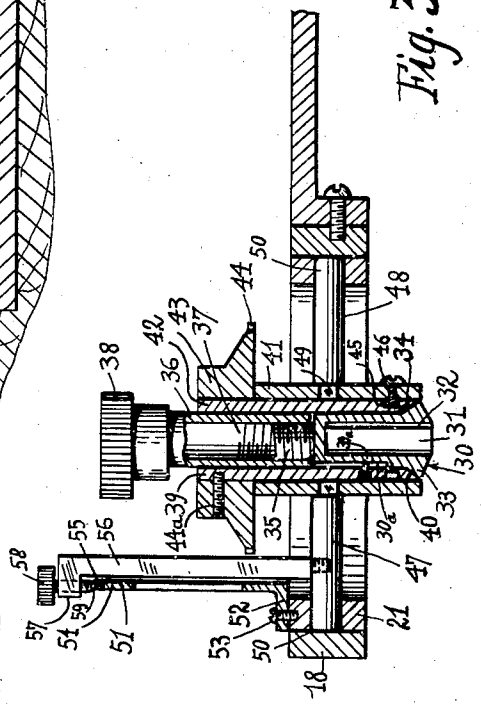


Fig. 3.

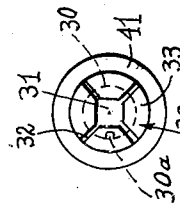


Fig. 4.

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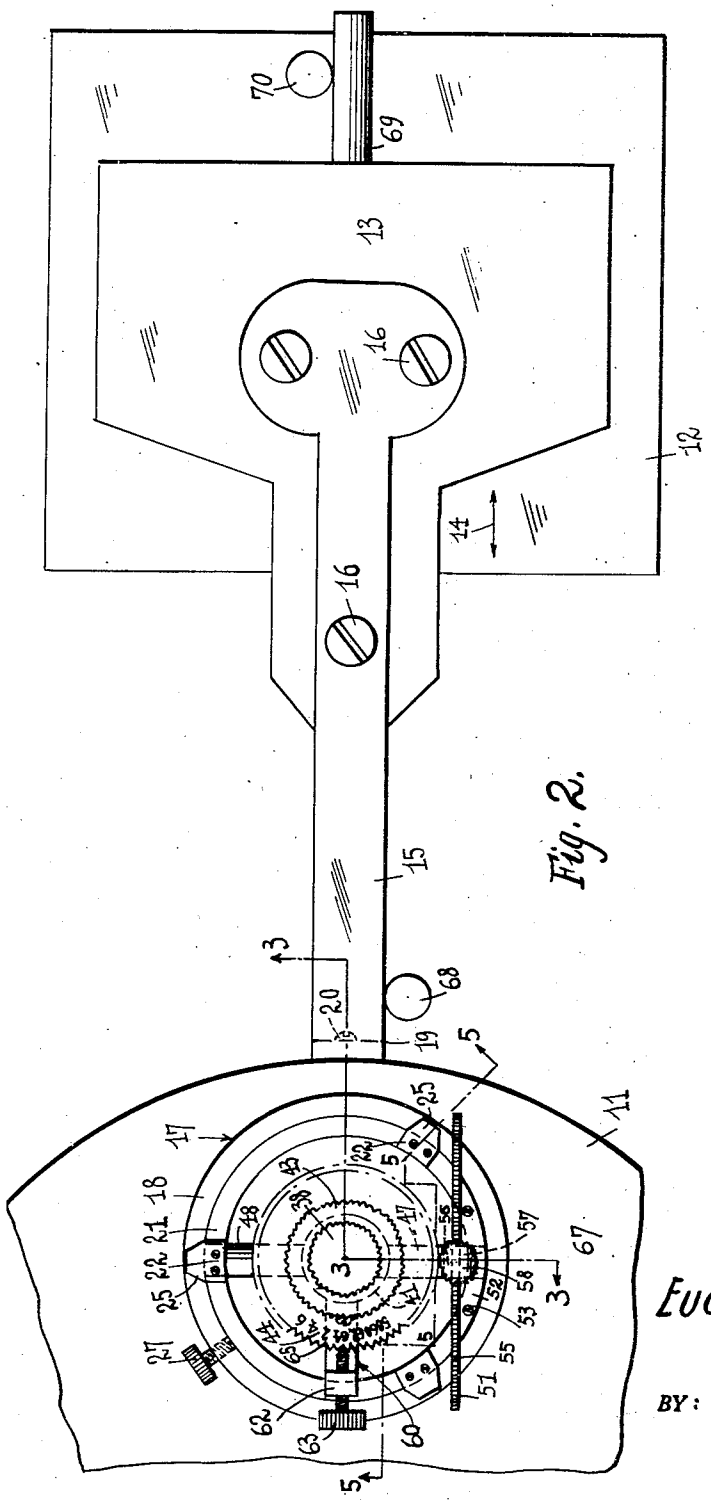


Fig. 2.

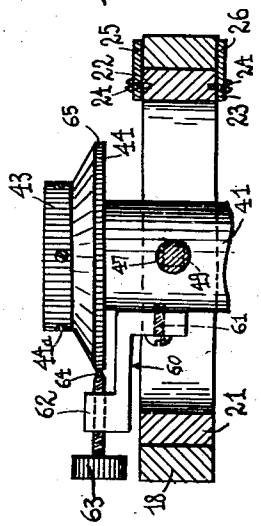


Fig. 5.

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DIAMOND POLISHING AND GRINDING DEVICE

Eugene Rothauser, New York, N. Y.

Application May 1, 1942, Serial No. 441,259

4 Claims. (Cl. 51—229)

This invention relates to grinding and polishing devices for gems, particularly diamonds and has for its main object to provide a device of this character which will be more practical and more efficient than the devices now used for such purpose.

Another object of my invention is to provide a device as characterized hereinbefore, which will be adapted to mechanically and automatically provide for three objects in grinding a gem, namely: to adjust and fix in each of the following three matters; to find and fix the best possible positions as to the grain of the gem with reference to the grinding and polishing lap; to adjust and fix the exact desired angle of the facet to be ground with reference to the axis of the gem, and to adjust to and fix the exact desired angle of the facets with reference to one another.

Still a further object of my invention is to provide a device of the above novel and desirable qualities which may be controlled by the operator by hand and may be moved to various positions on the lap as necessary and as usual with gem grinding and polishing, wherein the gem may easily be observed by him at any time, and which still will maintain the three mentioned adjustments of the gem automatically, continuously and in their respective fixed positions during all the operations, changes and observations.

Other objects of my invention will be apparent as the specification of the same proceeds, and among others I may mention: to provide a gem grinding and polishing device of the novel desirable qualities indicated which nevertheless will be simple in construction, inexpensive to manufacture, and easily adapted to be employed and used in present gem and diamond grinding and polishing establishments with practically no change in them.

In the drawings forming a part of this specification and accompanying the same:

Fig. 1 is a side elevational view of my novel gem grinding and polishing device, portions of the lap and of the working table or bench only being shown;

Fig. 2 is a plan view of the device shown in Fig. 1;

Fig. 3 is a fragmentary sectional elevation on a larger scale, the section being taken on the line 3—3 of Fig. 2, and

Fig. 4 is a bottom view of a gem holder chuck being a portion of my device;

Fig. 5 is another fragmentary sectional elevation, the section being taken on the line 5—5 of Fig. 2.

In grinding and polishing a diamond or other gem, it is very important to set the axis of said gem exactly perpendicular to the surface of the grinding or polishing lap. It is also very important to be able to tilt the gem exactly to the angle which the facet to be ground will have with said vertical axis. Also, when doing the grinding operations, the best relation of the grain of the gem to the grinding and polishing lap must be found for best results, as it is well known in this art, and, finally, after a facet has been ground or polished, the gem is to be rotated around its axis to the exact angle desired between the facet just finished and the next one to be ground.

Most of these adjustments have been done heretofore by hand and by the judgment of the expert diamond grinder and polisher, and the gem to be ground was held in the desired established position by hand. It is obvious that this method is very inferior, it is slow, uncertain and difficult, and the result depends on the skill and careful adaptation, patience and perseverance of the operator, and even with the best expert knowledge and best attention, very often mistakes will happen and the gem may be impaired, causing great financial loss.

I am aware of the fact that devices and machines have been proposed whereby these adjustments may be done mechanically and automatically, but, to my knowledge, none of these devices were practical and none of them are in use today, so that gem and diamond grinding still is done by manual labor and these adjustments and settings are made by relying on the knowledge and skill of the operator.

With my invention, a device is provided whereby the best position of the gem with reference to the adjustment of the grain to the grinding lap may be found and fixed or set. Also, the exact angle of a facet to the axis of the gem, and, finally, the exact desired angles of the facets to one another. All this with very simple means and operations and the gem may be fixed in my device in the exact desired position and so kept during the grinding operations, while my device also may be controlled by hand by the operator and may be removed and observed at any time, as it will be necessary to the best grinding results during such operations, without disturbing the mentioned three settings thereof, and with the ability to easily and safely return the same into its operative position and resume the grinding without any new setting.

With the above objects in view, my invention mainly consists of an arm which is easily slid-

able on the working bench or table radially to the rotating grinding and polishing disc lap, as it is usual at present and as it is familiar to diamond grinders or polishers, but the end of the inwardly or outwardly slidable arm over said lap, in my invention, contains a particular combination of simple devices, whereby the said three adjustments and settings of the gem may be executed.

In the drawings forming a part of this specification and accompanying the same, the numeral 10 indicates the working bench or table over a portion of which is arranged the rotating grinding or polishing lap 11. A metal base plate 12 may be set into the working bench or table in front of the lap 11, and a metal block 13 may be arranged over said plate 12 slidable thereon in an inward or outward radial direction with reference to the lap 11, as indicated by the double arrows 14. An arm 15 is secured over the block 13, as by the screws 16, and my adjusting device proper, indicated, in general, by the numeral 17 is housed in and carried by an outer ring 18 permanently secured to the outer end 19 of the arm 15 as by the screws 20. An inner ring 21 is closely, but slidably, set within the ring 18, being held in position by several pairs of upper and lower plates 22 and 23 secured at the upper and lower surfaces, respectively, of the inner ring 21 at the desired places thereof, as by the screws 24, and having respective projecting portions 25 and 26 slidably engaging the upper and lower surfaces of the outer ring 18. It will be seen that the inner ring 21 may slide in a right handed or left handed direction and rotate within the outer ring 18 to any desired position, the projections 25 and 26 of the plates 22 and 23 riding on the upper and lower respective surfaces of the outer ring 18. A set screw 27 may be provided through the outer ring 18 at any appropriate portion thereof, engaging the inner ring 21, and said inner ring may be secured in any of its positions within said outer ring by the set screw 27, as it will be obvious.

The gem to be ground is indicated at 28 and may be set into a holder for the same, as shown at 29, which, again, may be clamped and secured in the chuck 30 (Fig. 3), said chuck having a rectangular recess or opening 31 into which said gem holder 29 will fit, said chuck also having four axial incisions or separations 32, whereby it will have four arms or branches 33, slightly separated from one another by said incisions or slots 32, but being adapted to be brought nearer to one another or closed upon one another by their resiliency when an inward force is exerted on their conical outer surfaces 34. The gem holder 29 may simply be formed by a metal bar having a square upper portion to fit into the opening in the chuck, the lower end thereof having a recess into which is firmly set, projecting therefrom, the gem 28, prepared by sawing, preliminary trimming, grinding etc., for such a setting.

In my device, this chuck may have a screw threaded upper portion 35 set into a tube 36 and movable inwardly or outwardly in said tube by rotating the same and by the action of the screw threads 37 within said tube. A knurled knob 38 may be provided at the upper end of the tube 36 to facilitate its rotation in a right handed or left handed direction according whether the chuck 30 is to be moved inwardly or outwardly of the tube 36.

Tube 36 is snugly but slidably set into a tube or sleeve 39, said tube having a conical inner lower termination 40, which cone may cooperate with the outer cone surface 34 of the chuck 30. When the chuck 30 is lowered in the tube or sleeve 39 by the respective rotation of the inner tube 36, the cone surface 40 will cease its pressure on the surface 34 and the chuck may open, while when the chuck is pulled inwardly into the sleeve 39 by the opposite rotation of the inner tube 36, the said two cones will cooperate and the branches 33 of the chuck 30 will be pressed closer to one another, thereby firmly securing the gem holder 29 and with it the gem 28 in said chuck and in my device. A pin 39*a* secured into the tube 39 may project into a vertical slot 30*a* in the chuck 30, and may slide therein so as to prevent a rotation of the chuck when it is moved inwardly or outwardly.

The sleeve or tube 39, finally, is set, also snugly but slidably, in an outer sleeve 41, the upper portion 42 of said intermediate sleeve or tube 39 projecting over the top of the outer sleeve 41, and a knurled knob 43 with a dial disc 44 is secured on said upper portion 42 of the tube 39, as by the screws 44*a*.

It will be seen that the intermediate tube 39, and the dial 44 with it, may be rotated within the outer sleeve 41, and to secure the respective positions of the two sleeves within one another without impairing their relative rotation, a channel 45 may be cut in the intermediate sleeve 39, and a pin 46 may be secured inwardly in the outer sleeve 41, said pin riding in said channel 45, as will be obvious.

Two oppositely projecting, but axially aligned shafts 47 and 48 may be secured on the sleeve 41, as by their rectangular terminations 49, and may be journaled, by their outer ends 50, in the inner ring 21, so that the whole central gem holding device proper, with its various sleeves and tubes, all may be rotated in a horizontal direction by the right handed or left handed sliding or rotation of the inner ring 21, within the outer ring 18, and said gem holding and adjusting tubes and sleeves with their associated parts may also swing in a vertical plane on the horizontal axis of the shafts 47 and 48 by rotating said shafts, through their journaled portions 50, in the inner ring 21.

For measuring the said swinging of my device in a vertical plane on the shafts 47 and 48 and for fixing the same in any desired position, a vertical dial plate 51 may be secured on the inner ring 21 at any desired appropriate portion thereof, as by an angular lower base 52 thereof, the same being secured on the upper surface of the respective portion of the inner ring 21 by the screws 53.

The upper end 54 of the vertical dial plate 51 is in the form of a section or an arc of a circle and has the teeth 55 therein with right handed and left handed markings starting at a central zero and indicating angles in a right handed and left handed direction from said central up to 45° or 50° in each direction.

A standard or post 56 may be secured into the shaft 47 to the rear of the dial plate 51 and may have a forward upper angular projection 57 through which passes the securing screw 58, the lower pointed end 59 of which may enter any of the teeth 55 in the dial plate 51.

The devices associated with the vertical dial plate 51 will serve to set the gem into the right angular position with reference to the vertical

axis of the device, as will be more fully explained hereinafter.

For rotating the gem on its axis and setting the relative angles of the facets to be ground thereon, I employ the mentioned dial disc **44** and its associated parts, as also will be more fully explained presently.

An angular member, generally indicated by the numeral **60** may be radially secured on the outer sleeve **41**, as by the screw **61**, (Figs. 1, 2 and 5). The outer end **62** of said member **60** is over the rings **18** and **21** and an adjusting screw **63** passes therethrough, the inner pointed end **64** of which may engage any of the teeth **65** of the dial disc **44**.

I may remark that I prefer to set said member **60** and said securing and adjusting screw **63** at right angle to the rocking shafts **47** and **48** of my device, while, of course, it may be placed into any appropriate place.

The use and operation of my device may be obvious from the herein description thereof, but I want to offer the following more detailed explanation of it:

First the inner tubular parts and chuck will be tilted to the desired angle for the first facet to be ground. This will be done by withdrawing the screw **58** from the dial **51**, tilting the device on the shafts **47** and **48** and then securing it at the right angle by the screw **58** as will be obvious.

Now my device is lifted off the plate **12**, the gem **28** placed into the gem holder **29**, as indicated, whereupon the gem holder **29** will be placed into the opening of the chuck **30**, the inner tube **36** rotated by the knurled knob **38** in such a manner as to draw the chuck **30** inwardly and the conical surfaces **40** will press on the conical surfaces **34** of the chuck, and thereby firmly close the chuck on the gem holder **29**.

The device will now be replaced on the plate **12** and adjusted until the gem **28** will rest on the upper grinding surface **67** of the lap **11**.

Now I start a preliminary trial grinding operation to find out whether the grain of the gem is in a right relation to the lap **11** which an expert in this art may judge upon trial. When the result is not satisfactory, the set screw **27** will be loosened, thereby permitting a circular swinging of the inner ring **21** in the outer ring **18**, and the inner ring will be placed into various positions, thereby changing the position of the facet with reference to the lap **11**, until the best grinding position with relation to the grain of the gem **28** is obtained, whereupon the screw **27** will be driven tight against the inner ring **21** securing the same, and thereby the whole operating mechanism, and the gem secured therein, in that position.

The grinding and polishing operation on the facet now exposed to the upper surface **67** of the lap **11** may be executed, and as usual, the operator may move the block **13** radially inwardly and outwardly, thereby changing the position of the gem **28** on the lap **11**, as desired, and as he judges best. For this purpose, a limiting and guiding post **68** may be arranged on the one side of the arm **15**, while the block **13** may have a rearward extension rod **69** which is engaged by another post or pin **70** on the other side of the sliding arm and block **13**. This arrangement will permit an easy inward and outward sliding of the block **13**, arm **15** and all my devices with the gem therein at the inner end of the arm **15**, and will prevent any sideway motion thereof.

From time to time the operator may lift the device off the lap **11** and inspect the work done.

After the first facet, set as described above, is ground and polished to the extent desired, and as judged by the expert grinder operating the arm **15** and watching the progress of the operation, the securing or setting screw **64** cooperating with the dial disc **44** will be withdrawn, thereby permitting an axial rotation of the said concentric central tubes with the gem holder and the gem therein, while their inclination to the surface **67** of the lap will remain fixed by the dial **51** and the screw **58** set thereinto. The said concentric central tubes with the gem therein will now be rotated around the central axis thereof by the knurled knob **43**, which, as has been mentioned, is integral with the dial disc **44** and is secured on the tube **39** by the screws **44***a*, until the desired angle for the next facet to be ground is reached, whereupon the setting and securing screw **63** will be turned in an inward direction to engage and fix the dial **44** in that position. It will be obvious that the next facet may now be ground in a similar manner as the first one, and that it will have the pre-determined angle with reference to the earlier one.

In this manner, facets all around the circumference of the gem may be ground with perfection and with exactly the angles between them as pre-determined for the best effect for the gem.

As has been mentioned, it is to be noted that while my device permits a mechanical fixed and absolutely exact and reliable setting of the angles of the facets with reference to the central axis of the gem and the angles between the adjacent facets, and while it also permits a mechanical, absolutely reliable and fixable setting of the gem to the best direction of the grain for grinding and polishing, still the actual grinding and polishing is done by the manipulation of the arm **15** and block **13** by the grinder himself, so that he may exert his skill and guide the operation to the best effect by his personal touch, and it will be obvious that while my device is extremely simple, still it permits a perfectly reliable and absolute fixed setting of the gem for all the requirements mentioned hereinbefore, and at the same time it will permit a perfect guiding and supervising of the operation by the expert grinder himself, and an observation of the work done at any time and with greatest facility and with an easy, quick and safe restarting of the grinding or polishing.

I also want to remark that in the embodiment shown, the tilting of the central portion of my device with the gem carried by it, may be done only in the right handed direction, as viewed in Fig. 1, since in the other direction the fixing screw **63** for the setting of the angles between the facets would hit the rings **18** and **21** when the central tubular portion of the device is attempted to be tilted in a left handed direction. This, however, is no impairment in the working of my device, since all the angles desired may be set by a right handed swinging of the central tubular portions, as will be obvious.

The farthest swinging necessary for grinding and polishing is about 45°, and I show a vertical dial **51** with markings from zero to 45° in both directions. In a slightly modified embodiment of my device, said setting or fixing screw may be arranged further inwardly, or, vice versa, the

rings 18 and 23 may be made larger, with respect to the rotating dial 44 and the fixing or setting screw 63, so that the central tubular portion of the device, with the gem secured therein, may be tilted in both directions, right hand or left hand to the limit of the vertical dial, that is, to 45°–50°.

Similarly, I want to remark that in the drawings the knob 43 and dial 44 are shown somewhat higher than I intend to place them in actual practice. The mentioned higher position of said parts aids in the clearness of showing of the drawings, particularly of Fig. 1, but in such a position the knob 43 may hit the inner ring 21 before the central tubular part of my device is tilted to 45°–50°, and in actual practice said parts may be set lower, or the rings 18 and 21 made larger, as mentioned, permitting a limit tilting on the shafts 47 and 48 even over 50° if that should be desired in diamond grinding or in some other application and use of my device.

What I claim as new, is:

1. In a gem grinding and polishing device, having a rotatable lap, an arm with means at its end to hold the gem to be ground and polished, said end projecting over said lap, said end of the arm being in the form of a relatively stationary ring and another concentric ring rotatably set into said stationary ring, three concentric tubes at the center of said rings telescopically set into one another, and normally perpendicular to the plane of said rings, two transverse shafts secured on and oppositely projecting from the outermost of said tubes, the outer ends of said shafts being journalled in said inner ring so that said tube may be set to a desired inclination to the plane of said ring, but will rotate with said inner ring, the intermediate tube being rotatable within said outer tube but being prevented from an axial moving with relation thereto, and the innermost tube being axially movable within said intermediate tube, means between the intermediate and innermost tubes whereby the rotation of one will cause the other one to rotate therewith, means to rotate said intermediate tube, means to axially move and thereby lower or raise, said innermost tube, said gem being secured in the lower end of said innermost tube.

2. In a device, as set forth in claim 1, said means to rotate said intermediate tube comprising a disk shaped knob at the upper end thereof, a toothed dial disk on said knob, a member secured on said outermost tube, and a set screw in said member adapted to engage or disengage the teeth on said dial disk whereby to secure said intermediate tube and the parts associated therewith in the position into which they are rotated.

3. In a device, as set forth in claim 1, a screw threaded upward extension on said innermost tube, an upper tube set in said intermediate tube above said innermost tube, means to rotate said upper tube, the lower portion of said upper tube having inner screw threads engaging the screw threads on the extension of said innermost tube, whereby upon the rotation of said upper tube said innermost tube will be raised or lowered within said intermediate tube.

4. In a device, as set forth in claim 1, an up-standing dial segment on said inner ring rotatable therewith, having a toothed circular arc for its upper periphery, its center being set about opposite to one of said shafts on said outer tube, an up-standing post secured on said shaft and swingable therewith, a set screw carried by the upper end of said post and adapted to engage or disengage the teeth of said dial segment and thereby secure said tubes in their tilted positions.

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