C. J. COLEMAN.

GEM POLISHING MACHINE.

APPLICATION FILED NOV. 25, 1912. RENEWED JULY 22, 1915.

1,173,174.

Patented Feb. 29, 1916.

4 SHEETS—SHEET 1.

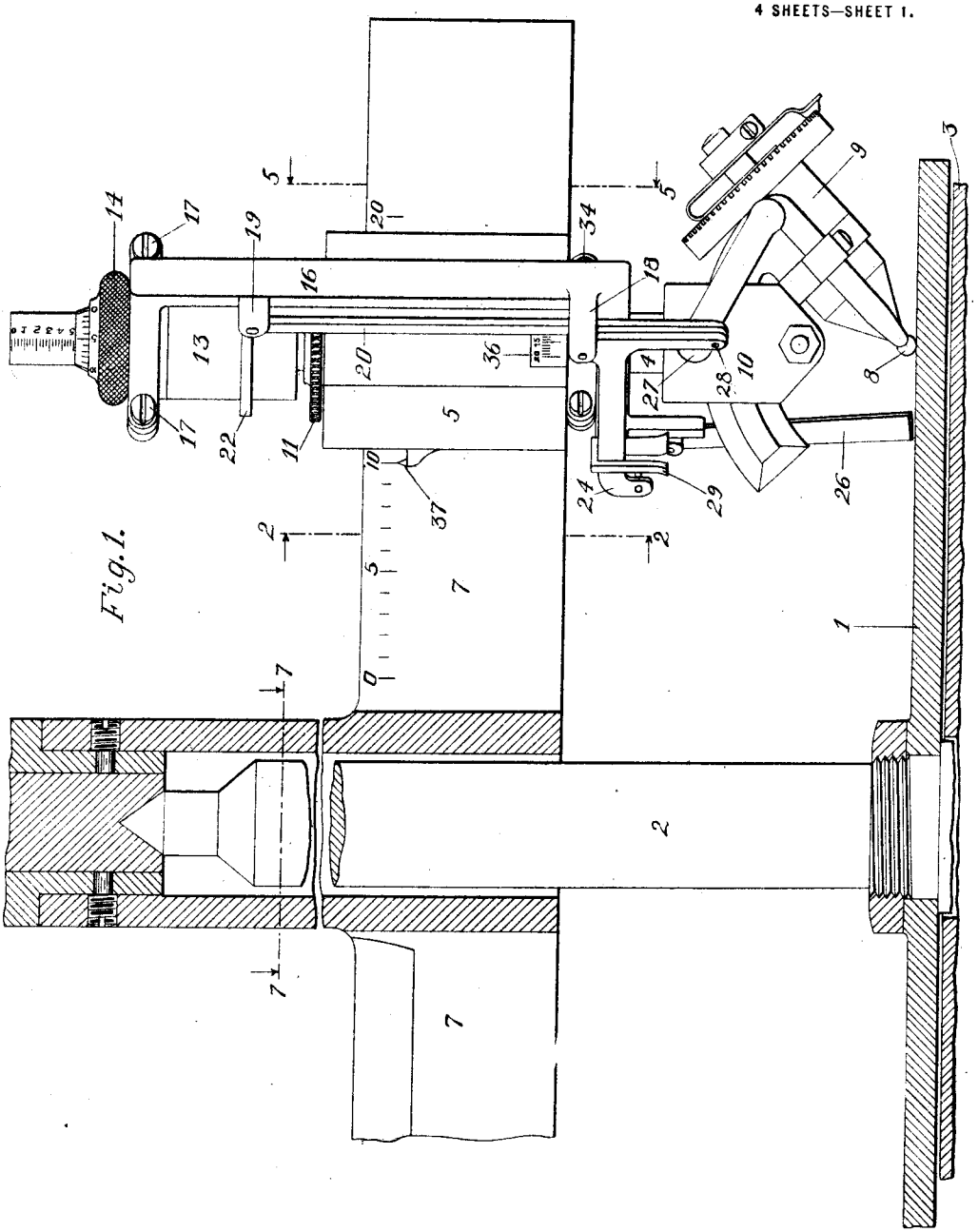

Fig. 1.

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4 SHEETS—SHEET 2.

Fig. 3.

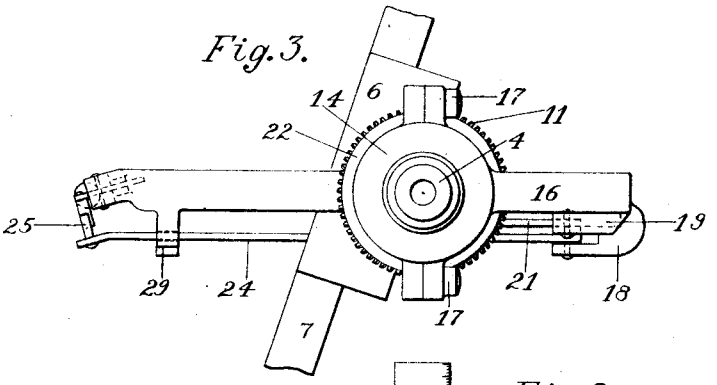


Fig. 2.

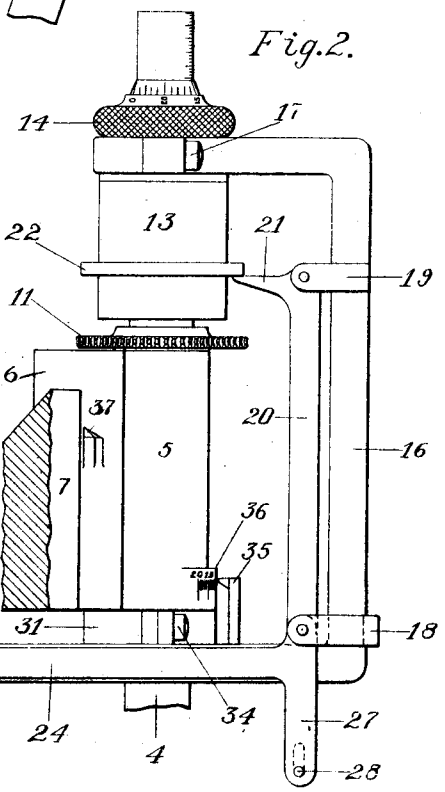
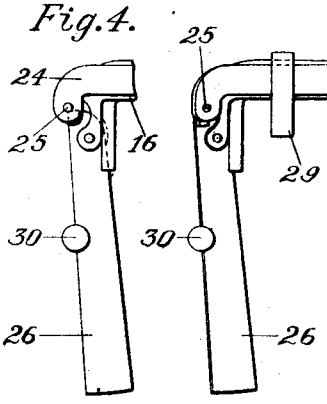


Fig. 4.



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4 SHEETS—SHEET 3.

Fig. 6.

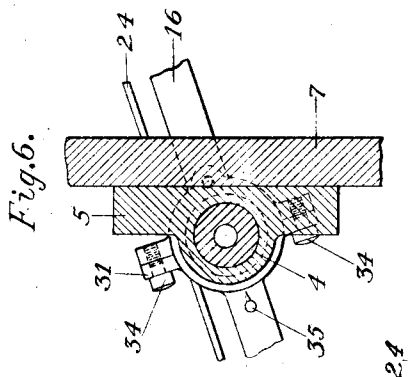
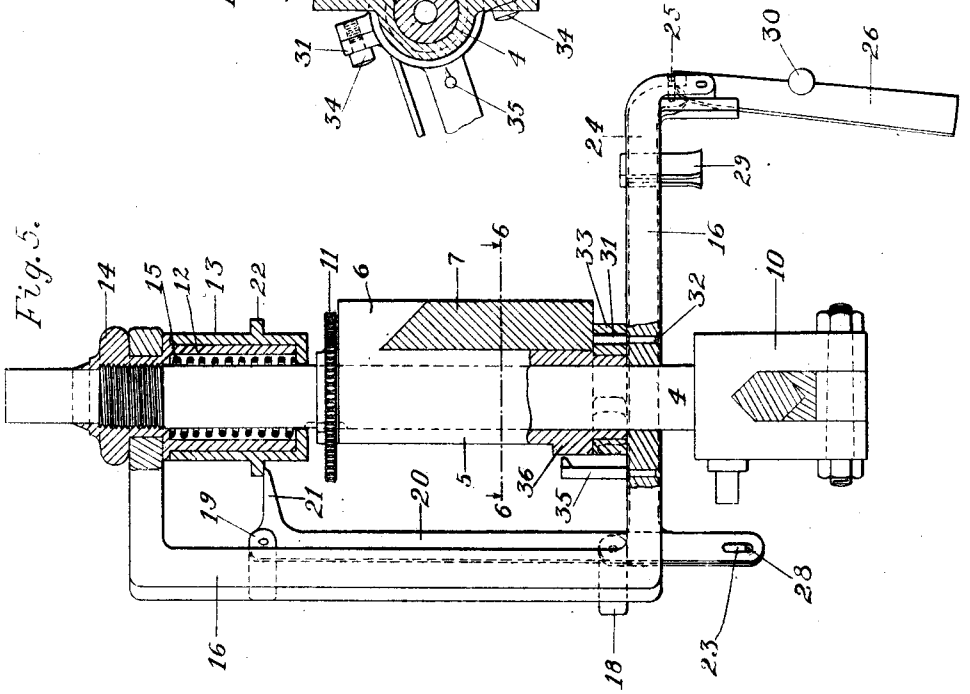


Fig. 5.



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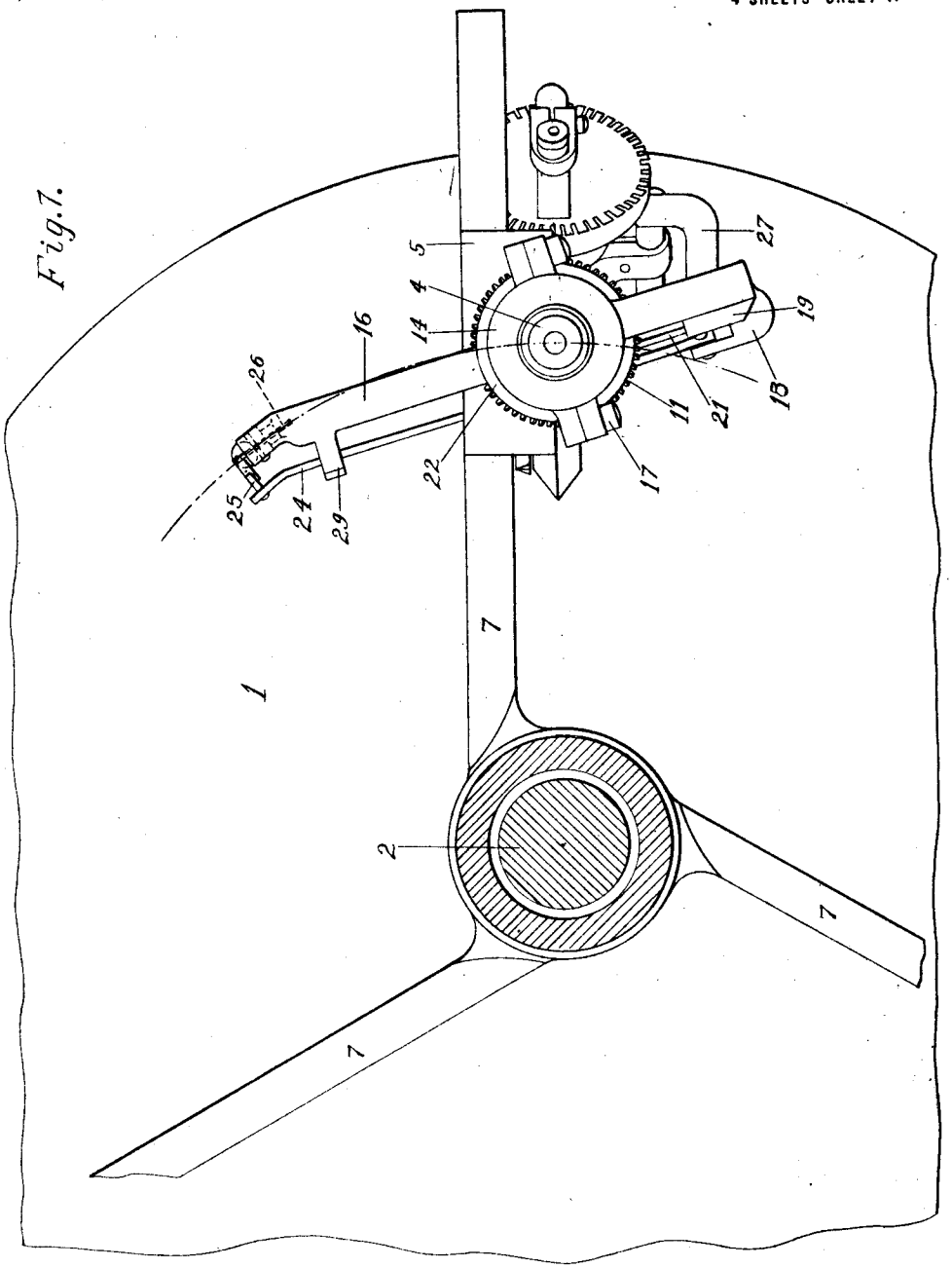
4 SHEETS—SHEET 4.

Fig. 7.



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UNITED STATES PATENT OFFICE.

CLYDE J. COLEMAN, OF NEW ROCHELLE, NEW YORK, ASSIGNOR, BY MESNE ASSIGNMENTS, TO STERN-COLEMAN DIAMOND MACHINE COMPANY, INC., A CORPORATION OF NEW YORK.

GEM-POLISHING MACHINE.

1,173,174. Specification of Letters Patent. Patented Feb. 29, 1916.

Application filed November 25, 1912, Serial No. 733,418. Renewed July 22, 1915. Serial No. 41,395.

To all whom it may concern:

Be it known that I, CLYDE J. COLEMAN, a citizen of the United States, residing at New Rochelle, in the county of Westchester and State of New York, have invented certain new and useful Improvements in Gem-Polishing Machines, of which the following is a specification, reference being had therein to the accompanying drawings, forming part thereof.

My invention relates to gem polishing machines, and particularly to depth gages for such machines.

The brilliancy of polished gems, such as diamonds, depends in main upon the dimensions of the stone and upon the correct symmetrical geometrical arrangement of the facets about the geometrical center of the stone, since these facets produce the reflection and refraction of light entering the stone. Each facet contributes to this result and is an important element in the reflection, and hence the improper disposition of any one facet may considerably impair the general effect. The arrangement and depth of each facet are, therefore, regulated in the polishing operation with the utmost precision, and the over-polishing of a facet necessitates the reduction in size of the entire stone, since every other facet must be polished down to a corresponding depth to maintain the symmetry and resultant brilliancy of the stone.

My invention has for an object to provide an automatic depth gage which will accurately determine the depth to which the stone is polished.

Other objects are reliability and simplicity of operation, and durability, rigidity and compactness of construction.

Still other objects and advantages of my invention will appear from the following description.

My invention comprehends a depth gage which moves toward the lap as the stone is polished off and contacts therewith at a predetermined time and is operated thereby. More specifically, the depth gage operates as an automatic throw-out.

My invention also comprehends an operating member which is arranged to engage the lap in the path of the gem upon the lap, with the result that the gem and the operating member are not differentially affected by unevennesses upon the lap. Furthermore, the operating member is adjustable relative to the gem toward and from the lap to regulate the time of contact during the polishing operation, and is adjustable angularly about the gem to bring it into tracking relation with the gem.

My invention also comprehends various other features of construction and combinations and arrangements of parts, as will hereinafter more fully appear.

I shall now describe the embodiment of my invention illustrated in the accompanying drawings, and shall thereafter point out my invention in claims.

Figure 1 is an elevation, partly in section, of a machine embodying my invention. Fig. 2 is a vertical section of the same, on line 2—2 of Fig. 1 looking toward the left, showing the gem-holding head in side elevation with parts broken away, the head being turned relative to the supporting arm so that the supporting arm appears in perspective. Fig. 3 is a plan of the same. Fig. 4 is a detail in side elevation of the trigger and outer end of the connected parts. Fig. 5 is a vertical section on line 5—5 of Fig. 1, looking toward the left, showing the gem-holding head partly in section and partly in elevation. Fig. 6 is a horizontal section of the same, on line 6—6 of Fig. 5, looking down, parts being broken away. Fig. 7 is a plan of the parts shown in Fig. 1 with the shaft and bearing therefor in horizontal section on line 7—7.

The illustrated machine has a disk shaped rotative lap 1 rigidly mounted upon a vertical shaft 2, which bears in the table 3 of the machine and to which power is applied in any suitable way. The upper or the polishing surface of the lap is coated with diamond dust or suitable abrasive, as is usual.

To hold the gem which is being polished in contact with the polishing surface of the lap 1, a polishing head is provided which is carried on the lower end of a vertical spindle 4. This vertical spindle 4 is mounted for free longitudinal movement within certain limits, as will hereinafter appear, in a spindle-supporting block 5, which has an undercut or beveled overhanging portion 6 which fits the upper beveled edge

of an overhanging supporting arm 7, of which there are three, extending radially out from the upper bearing for the shaft 2, disposed 120° apart, a gem-holding head being provided on each arm 7. This supporting arm extends transversely of the lap 1 and the supporting block 5 is, therefore, free to move longitudinally of the supporting arm 7, and the sloping or beveled engaging faces of the two members cause the supporting block to be held by gravity securely to its supporting arm 7, and the vertical engaging faces of the two members are of substantial length as shown, and the movement of the block along the supporting arm is thereby rendered steady. In the machine shown, the supporting arm 7 extends parallel to the radial line of the lap 1 occupied by the gem or stone, and in the movement of the block 5 along the arm 7 the arm serves to guide the stone in a radial line transversely of the lap. The spindle 4 is normally held by gravity with the stone 8 resting upon the polishing surface of the lap, in the position shown in the drawings, and it, therefore, falls down with the stone as the stone is polished off, while being free to be moved longitudinally away from the lap.

The polishing or dop-holding head 9 may be of any suitable construction and is adjustably carried in the enlarged lower bifurcated end 10 of the spindle 4. The construction of this polishing head and the means for adjusting it form no part of this invention, but are described and claimed in my copending application Serial Number 733,417, filed on even date herewith. This polishing head provides for adjusting the gem to present the different facets to the lap and to vary the angle at which the gem contacts with the lap. A motor-driven worm (not shown) coöperates with a worm wheel 11, which is splined on the spindle 4, and provides means for continuously rotating the gem upon the lap, as described in my said copending application.

To prevent the stone from being polished to too great a depth at any facet, an automatic depth gage is provided, which by suitable means indicates when the proper depth has been reached, and also preferably disengages the stone from the lap at that time, preferably by mechanical means, and which, in the illustrated embodiment, consists of an automatic tripping or throw-out device operated by a contact member which becomes operative at the conclusion of the polishing operation upon every facet. The illustrated device consists of means for raising the gem holder and gem away from the lap, and a trigger for operating this mechanism which follows in the path of the gem upon the lap and is so adjusted that it strikes the lap at a predetermined stage of the polishing operation, and is tripped thereby and operates the lifting mechanism. Two coöperative spring cups 12 and 13 are arranged upon the upper end of spindle 4, the former being integral with a micrometer screw 14 on the spindle 4, and the latter telescoping over the spring cup 12, and being arranged reversely thereto. A coiled thrust spring 15 surrounds the spindle 4, and bears at its upper end against the top of the inner cup 12, and at its lower end against the bottom of the outer slidable cup 13, and tends to spread these cups apart, until the bottom of the cup 13 strikes the worm wheel 11, which rests upon the spindle-supporting block 5, and then the further separation of the cups raises the spindle 4 as far as the head 10 on the spindle 4 will permit. The outer slidable cup 13 is, however, normally locked against the tension of the spring 15 by a compound lever device, as will now be described.

A lever-supporting member 16 of general U-shape is arranged with its legs horizontal and its base vertical, and its upper leg terminates in a split collar pivotally clamped about a circumferentially reduced portion of the micrometer screw 14 by clamp screws 17, and the lower leg of the lever-supporting member 16, which is elongated, pivots over the spindle 4 near the lower end of the spindle slightly above the head 10. The lever-supporting member 16 is thus free to swing angularly about the spindle 4. By reason of its shape and arrangement, this lever-supporting member also conveniently serves as a handle in lifting the gem-holding head.

Pivoted at its upper end to a lug 19 on the vertical portion of the lever-supporting member 16 is a latch lever 20, which is provided with a latch projection 21 arranged to latch under a flange 22 on the slidable cup member 13, and which is provided in its lower end with a longitudinally extending slot 23. Extending at right angles to the latch lever 20 along the lower leg of the lever-supporting member 16, is a locking lever 24, pivoted at its rear end to a lug 18 on the lever-supporting member 16, and provided at its front end with a laterally projecting pin 25 which is adapted to rest on the upper rounded end of a trigger 26 pivoted near its upper end to the downwardly projecting end of the lower leg of the lever-supporting member 16. The rear end of this locking lever 24 is provided with an integral depending arm 27 carrying on its lower end a laterally projecting pin 28 engaging in the slot 23. It is apparent that, as long as the outer end of the locking lever 24 is held up by the pin 25 resting upon the top of the trigger 26, the lower end of the latch lever is held in and the latching projection 21 holds the cup members 12 and 13 closed

against the tension of the spring 15, in the position shown in the drawings. When the trigger 26 is rocked upon its pivot and the pin 25 rides off the trigger, the front end of the locking lever 24 drops down and the lower end of the latch lever 20 swings outwardly under the tension of the spring 15. The spring 15 thereupon separates the two cup members, and raises the spindle 4 and lifts the gem 8 off the lap. The lower end of the trigger 26 is arcuate and concentric with the pivot of the trigger, so that when the trigger engages the lap, it merely rolls about the pivot and does not tend to elevate the connected parts and thereby minimizes wear. The trigger is guided laterally by a vertical U-shaped guide 29 on the lower legs of the lever-supporting member 16, and the trigger is provided at its side toward the pin 25 with a weight 30, which tends to hold the trigger underneath the pin 25 until the trigger is rocked by engagement with the lap.

The trigger 26 is arranged to engage the lap at a predetermined time during the polishing operation. To adjust the trigger vertically in accordance with the depth to be polished, the operator has only to turn the micrometer screw 14 which engages screw threads on the spindle 4, and this micrometer screw carries the lever-supporting member 16 and the parts carried thereby toward and away from the lap. By these means the trigger can be set with the most accurate adjustment, and it will be noted that the rigid supporting member 16 and its manner of attachment permit no looseness or play of the parts.

The trigger 26 is arranged so that it engages the lap directly behind the gem, as shown in Fig. 7, so that it will engage precisely the same path upon the lap that the gem does, and the two will not be differentially affected by unevennesses of the lap. To bring the trigger into tracking relation with the gem, it is only necessary to swing the lever-supporting member 16 angularly about the spindle 4. To lock the lever-supporting member in adjusted position, it is connected to a friction collar 31 by a pin 32 which extends into a tubular guide 33 in the friction collar (see Fig. 5). This friction collar 31 is clamped by screws 34 about a reduced hub portion on the lower end of the spindle-supporting block 5, and is clamped sufficiently tightly to hold it against being turned by the ordinary stresses developed in the polishing operation, while permitting it to be turned without loosening the clamping screws 34 when sufficient force is applied for that purpose. The pin and guide tube connection between the lever-supporting member and the friction collar lock the lever-supporting member and hence the trigger 26 in adjusted position, while permitting lever-supporting member and the parts carried thereby to move vertically relative to the friction collar 31.

The lever-supporting member 16 is provided with a pointer 35 which coöperates with a calibrated scale 36 on the spindle-supporting block 5 to indicate the angular position of adjustment of the trigger 26. The supporting arm 7 is also correspondingly calibrated, and a pointer 37 on the supporting block 5 coöperates therewith, as shown in Fig. 1, and, consequently, when the indications on the arm 7 and scale 36 agree, the trigger is in tracking relation with the gem. It is apparent that a movement of the gem-carrying head along the arm 7 will differentially vary the distances of the trigger 26 and gem 8 from the center of the lap, and, hence, will throw the trigger out of tracking relation with the gem. To bring it again into tracking relation, it is only necessary to swing the lever-supporting member angularly about the spindle 4 until the reading on the scale 36 accords with that on the arm 7.

It is obvious that various modifications may be made in the construction shown in the drawings and above particularly described within the principle and scope of my invention.

I claim:

1. A gem polishing machine comprising a relatively movable lap member, a gem holder arranged to hold a gem in contact with the lap and to approach the lap as the gem is polished, and a depth gage movable toward and from the lap with the gem holder and including an operating member arranged to engage the lap in the path of the gem at a predetermined stage of the polishing operation and to be operated thereby to operate the depth gage.

2. A gem polishing machine comprising a relatively movable lap member, a gem holder arranged to hold a gem in contact with the lap and to approach the lap as the gem is polished and shiftable to apply the gem to different paths on the lap, and a depth gage mechanism movable toward and from the lap with the gem holder and operative to move the gem holder away from the lap and including an operating tripping member arranged at a predetermined stage of the polishing operation to be operated and thereby operate the depth gage to move the gem holder away from the lap.

3. A gem polishing machine comprising a relatively movable lap member, a gem holder arranged to hold a gem in contact with the lap and to approach the lap as the gem is polished, normally inoperative disengaging means arranged when operated to disengage the gem holder away from the lap, and a trigger carried by the gem holder and arranged in control of the disengaging

means and adapted to engage the lap at a predetermined stage of the polishing operation and to be operated thereby to operate the disengaging means.

4. A gem polishing machine comprising a relatively movable lap member, a gem holder arranged to hold a gem in contact with the lap and to approach the lap as the gem is polished and shiftable to apply the gem in different paths on the lap, normally inoperative disengaging means arranged when operated to disengage the gem holder away from the lap, and a trigger carried by the gem holder and arranged in control of the disengaging means and adapted to engage the lap in the path of the gem upon the lap at a predetermined stage of the polishing operation and to be operated thereby to operate the disengaging means.

5. A gem polishing machine comprising a relatively movable lap member, a spindle arranged perpendicular to the lap and mounted for free axial movement and normally held at its closest approach to the lap, a polishing head carried by the spindle and arranged to hold the gem in contact with the lap, normally inoperative disengaging means arranged when operated to lift the spindle axially from the lap, and a trigger carried by the spindle and arranged in control of the lifting means and adapted to engage the lap at a predetermined stage of the polishing operation and to be operated thereby to operate the disengaging means.

6. A gem polishing machine comprising a relatively movable lap member, a spindle arranged perpendicular to the lap and mounted for free axial movement and normally held at its closest approach to the lap, a polishing head carried by the spindle and arranged to hold the gem in contact with the lap in a predetermined path thereon, normally inoperative disengaging means arranged when operated to lift the spindle axially from the lap, and a trigger carried by the spindle and arranged in control of the lifting means and adapted to engage the lap in the path of the gem upon the lap at a predetermined stage of the polishing operation and to be operated thereby to operate the disengaging means.

7. A gem polishing machine comprising a relatively movable lap member, a spindle arranged perpendicular to the lap and mounted for free axial movement and normally held at its closest approach to the lap, a polishing head carried by the spindle and arranged to hold the gem in contact with the lap, normally inoperative disengaging means arranged when operated to lift the spindle axially from the lap, a trigger carried by the spindle and arranged in control of the lifting means and adapted to engage the lap at a predetermined stage of the polishing operation and to be operated thereby to operate the disengaging means, and means for adjusting the trigger longitudinally of the spindle.

8. A gem polishing machine comprising a relatively movable lap member, a spindle arranged perpendicular to the lap and mounted for free axial movement and normally held at its closest approach to the lap, a shiftable polishing head carried by the spindle and arranged to hold the gem in contact with the lap in a predetermined path thereon according as the polishing head is shifted, normally inoperative disengaging means arranged when operated to lift the spindle axially from the lap, a trigger carried by the spindle and arranged in control of the lifting means and adapted to engage the lap in the path of the gem upon the lap at a predetermined stage of the polishing operation and to be operated thereby to operate the disengaging means, and means for adjusting the trigger longitudinally of the spindle.

9. A gem polishing machine comprising a rotary lap, a bearing member, a spindle arranged perpendicular to the lap and mounted in the bearing member for free axial movement therein, a polishing head carried by the spindle and arranged to hold a gem in contact with the lap, resilient means operative to lift the spindle and polishing head away from the lap, locking means arranged to lock the resilient means, and a trigger device carried by the spindle and arranged in control of the locking means and operative to engage the lap at a predetermined stage of the polishing operation and to be tripped thereby and release the locking means.

10. A gem polishing machine comprising a rotary lap, a bearing member shiftable transversely of the lap, a spindle arranged perpendicular to the lap and mounted in the bearing member for free axial movement therein, a polishing head carried by the spindle and arranged to hold a gem in contact with the lap in a path thereon determined by the position of the shiftable bearing member, resilient means operative to lift the spindle and polishing head away from the lap, locking means arranged to lock the resilient means, and a trigger device carried by the spindle and arranged in control of the locking means and operative to engage the lap in the path of the gem upon the lap at a predetermined stage of the polishing operation and to be tripped thereby and release the locking means.

11. A gem polishing machine comprising a rotary lap, a bearing member, a spindle arranged perpendicular to the lap and mounted in the bearing member for free axial movement therein, a polishing head carried by the spindle and arranged to hold a gem in contact with the lap, resilient

means operative to lift the spindle and polishing head away from the lap, locking means arranged to lock the resilient means, a trigger device carried by the spindle and arranged in control of the locking means and operative at a predetermined stage of the polishing operation and be tripped and thereby release the locking means, and means to adjust the trigger longitudinally of the spindle.

12. A gem polishing machine comprising a rotary lap, a bearing member, a spindle arranged perpendicular to the lap and mounted in the bearing member for free axial movement therein, a polishing head carried by the spindle and arranged to hold a gem in contact with the lap, resilient means operative to lift the spindle and polishing head away from the lap, locking means arranged to lock the resilient means, a trigger device carried by the spindle in the path of the gem upon the lap and arranged in control of the locking means and operative to engage the lap at a predetermined stage of the polishing operation and to be tripped thereby and release the locking means, and means to adjust the trigger angularly about the spindle to bring the trigger into the path of the gem.

13. A gem polishing machine comprising a rotary lap, a bearing member, a spindle arranged perpendicular to the lap and mounted in the bearing member for free axial movement therein, a polishing head carried by the spindle and arranged to hold a gem in contact with the lap, resilient means operative to lift the spindle and polishing head away from the lap, locking means arranged to lock the resilient means, a trigger device carried by the spindle in the path of the gem upon the lap and arranged in control of the locking means and operative to engage the lap at a predetermined stage of the polishing operation and to be tripped thereby and release the locking means, means to adjust the trigger angularly about the spindle to bring the trigger in the path of the gem, and means to adjust the trigger longitudinally of the spindle.

14. A gem polishing machine comprising a rotary lap, a bearing member, a spindle arranged perpendicular to the lap and mounted in the bearing member for free axial movement therein, a polishing head carried by the spindle and arranged to hold a gem in contact with the lap, resilient means operative to lift the spindle and polishing head away from the lap; and a depth gage comprising a lever arranged to control the resilient means, a locking lever arranged to lock the control lever in locking position, and a pivoted trigger arranged to hold the locking lever in locking position and to be operated at a predetermined stage of the polishing operation and rocked upon its pivot and release the locking lever, thereby tripping the depth gage and releasing the resilient means.

15. A gem polishing machine comprising a rotary lap, a bearing member, a spindle arranged perpendicular to the lap and mounted in the bearing member for free axial movement therein, a polishing head carried by the spindle and arranged to hold a gem in contact with the lap, resilient means operative to lift the spindle and polishing head away from the lap; and a depth gage comprising a latch lever arranged to lock the resilient means, a locking lever arranged to lock the latch lever in locking position, a pivoted trigger arranged to hold the locking lever in locking position and to engage the lap in the path of the gem at a predetermined stage of the polishing operation and to be rocked upon its pivot thereby and release the locking lever thereby tripping the depth gage and releasing the resilient means, means to adjust the trigger longitudinally of the spindle, and means to adjust the trigger angularly about the spindle to bring the trigger in the path of the gem.

16. A gem polishing machine comprising a relatively movable lap, a calibrated supporting arm overhanging the lap, a gem carrying head supported on the supporting arm and adjustable along the length thereof, a depth gage carried by the head, an operating trigger for the depth gage arranged to engage the lap and to be operated thereby at a predetermined stage of the polishing operation, an angularly movable support for the trigger for moving the trigger into tracking relation with the gem, and a calibrated scale for indicating the position of adjustment of the trigger and corresponding in its calibration to the calibration on the supporting arm.

17. A gem polishing machine comprising a relatively movable lap and a gem-holding head coöperative therewith, the gem-holding head comprising a spindle movable toward and from the lap, a spindle support, a depth gage, and a substantially U-shaped supporting member for the depth gage movable with the spindle and mounted for angular movement relative to the spindle.

18. A gem-polishing machine having in combination a rotary lap, a movable gem-holder for holding the gem upon the lap during the polishing operation, and means having a member movable with the gem-holder and adapted to engage the lap at a predetermined stage in the polishing operation for arresting the polishing operation.

19. A gem-polishing machine having in combination a flat rotary lap, a gem-holder for holding the gem upon the lap during the polishing operation, means for withdrawing

the gem from the lap, and means adapted to engage the lap in the path of the gem and cause said withdrawing means to withdraw the gem from the lap at a predetermined stage in the polishing operation.

20. A gem-polishing machine having, in combination, a rotary lap, a gem-holder for holding the gem upon the lap during the polishing operation and movable to shift the gem to different paths on the lap, and means having a member adapted to engage the lap in the path of the gem on the lap at a predetermined stage in the polishing operation for arresting the polishing operation.

21. A gem-polishing machine having, in combination, a rotary lap, a gem-holder for holding the gem upon the lap during the polishing operation, means for withdrawing the gem from the lap, and means having a member adapted to engage the lap at a predetermined stage in the polishing operation and cause said withdrawing means to withdraw the gem from the lap at a predetermined stage in the polishing operation.

22. A gem-polishing machine having, in combination, a rotary lap, a gem-holder for holding the gem upon the lap during the polishing operation and adapted to move toward the lap as the gem is polished, means for withdrawing the gem from the lap, and means movable with said holder having a member adapted to engage the lap in the path of the gem at a predetermined stage in the polishing operation and cause said withdrawing means to withdraw the gem from the lap at a predetermined stage in the polishing operation.

23. In an apparatus of the class described, the combination of a rotary polishing lap, a gem holder, means whereby the gem holder and gem are fed toward the lap during the polishing and means whereby the gem and gem holder are withdrawn from the lap at a predetermined stage of the polishing, said means comprising a trigger, a lever coöperating therewith and adapted to be released upon the tripping of the trigger, another lever adapted to be set in motion upon said first lever becoming released, and a spring adapted to be released by said second lever to withdraw the gem and its holder from the lap.

24. In an apparatus of the class described, the combination of a polishing lap, a suitable frame, a gem holder for holding the gem in engagement with the lap and adapted to be fed toward the lap during the polishing operation and means whereby the gem is automatically withdrawn from the lap at a predetermined stage in the polishing operation, said means comprising a trigger, a spring, means whereby one end of the spring acts on the gem holder, a member through which the other end of the spring may be permitted to act against a part on the frame to withdraw the gem from the lap, and intermediate mechanism controlled by the trigger and controlling said member, to permit the spring to act to withdraw the gem holder and gem from the lap.

25. In an apparatus of the class described, the combination of a polishing lap, a suitable frame, a gem holder for holding the gem in engagement with the lap and adapted to be fed toward the lap during the polishing operation, means whereby the gem is automatically withdrawn from the lap at a predetermined stage in the polishing operation, said means comprising a trigger, a spring, means whereby one end of the spring acts on the gem holder, a member through which the other end of the spring may be permitted to act against a part on the frame to withdraw the gem from the lap, and intermediate mechanism controlled by the trigger and controlling said member, to permit the spring to act to withdraw the gem holder and gem from the lap and a micrometer screw for adjusting the relative position of the gem to the lap at which the gem is withdrawn.

26. In an apparatus of the class described, the combination of a rotary polishing lap, an arm extending over said lap parallel thereto, a gem carrying head slidable along said arm to carry the gem on the lap in various positions radially of the lap and means for arresting the polishing of the gem at any of its various positions on the lap when the gem has been polished to a predetermined extent.

27. In an apparatus of the class described, the combination of a rotary polishing lap, an arm extending over said lap parallel thereto, a gem carrying head slidable along said arm to carry the gem on the lap in various positions radially of the lap, and means for arresting the polishing of the gem at any of its various positions on the lap when the gem has been polished to a predetermined extent, said last mentioned means comprising a spring operated device carried by the said carrying head and set into operation responsive to a certain movement of the gem toward the lap.

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

CLYDE J. COLEMAN.

Witnesses:
VICTOR D. BORST,
WM. A. KELLY.

Correction in Letters Patent No. 1,173,174.

It is hereby certified that in Letters Patent No. 1,173,174, granted February 29, 1916, upon the application of Clyde J. Coleman, of New Rochelle, New York, for an improvement in "Gem-Polishing Machines," an error appears in the printed specification requiring correction as follows: Page 5, line 7, claim 11, for the word "and", first occurrence, read *to;* and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 11th day of April, A. D., 1916.

[SEAL.]

R. F. WHITEHEAD,

Acting Commissioner of Patents.

Cl. 51—11.