

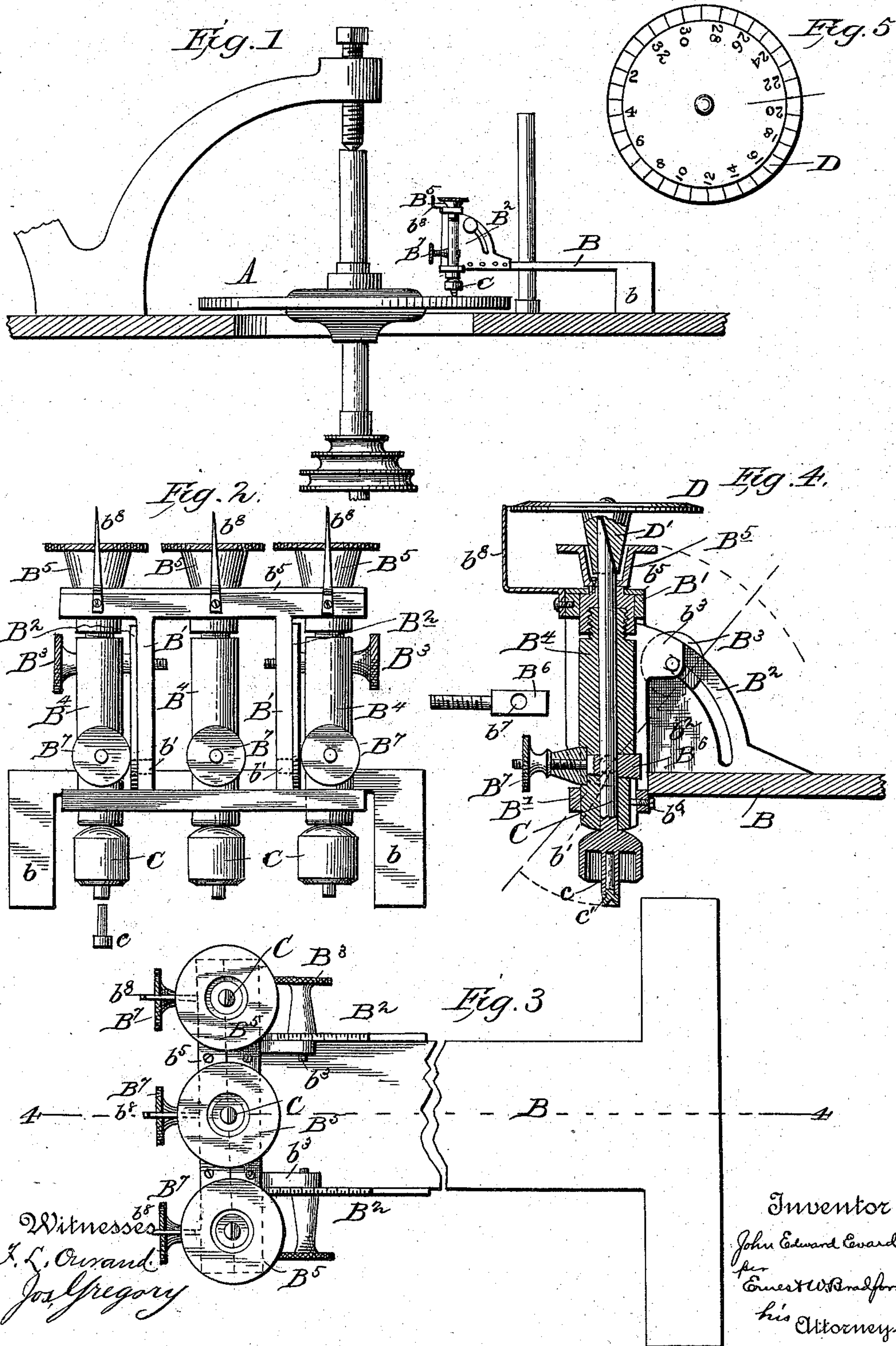
(No Model.)

2 Sheets—Sheet 1.

J. E. EVARD.
METHOD OF AND APPARATUS FOR GRINDING AND POLISHING
PRECIOUS STONES.

No. 557,980.

Patented Apr. 7, 1896.



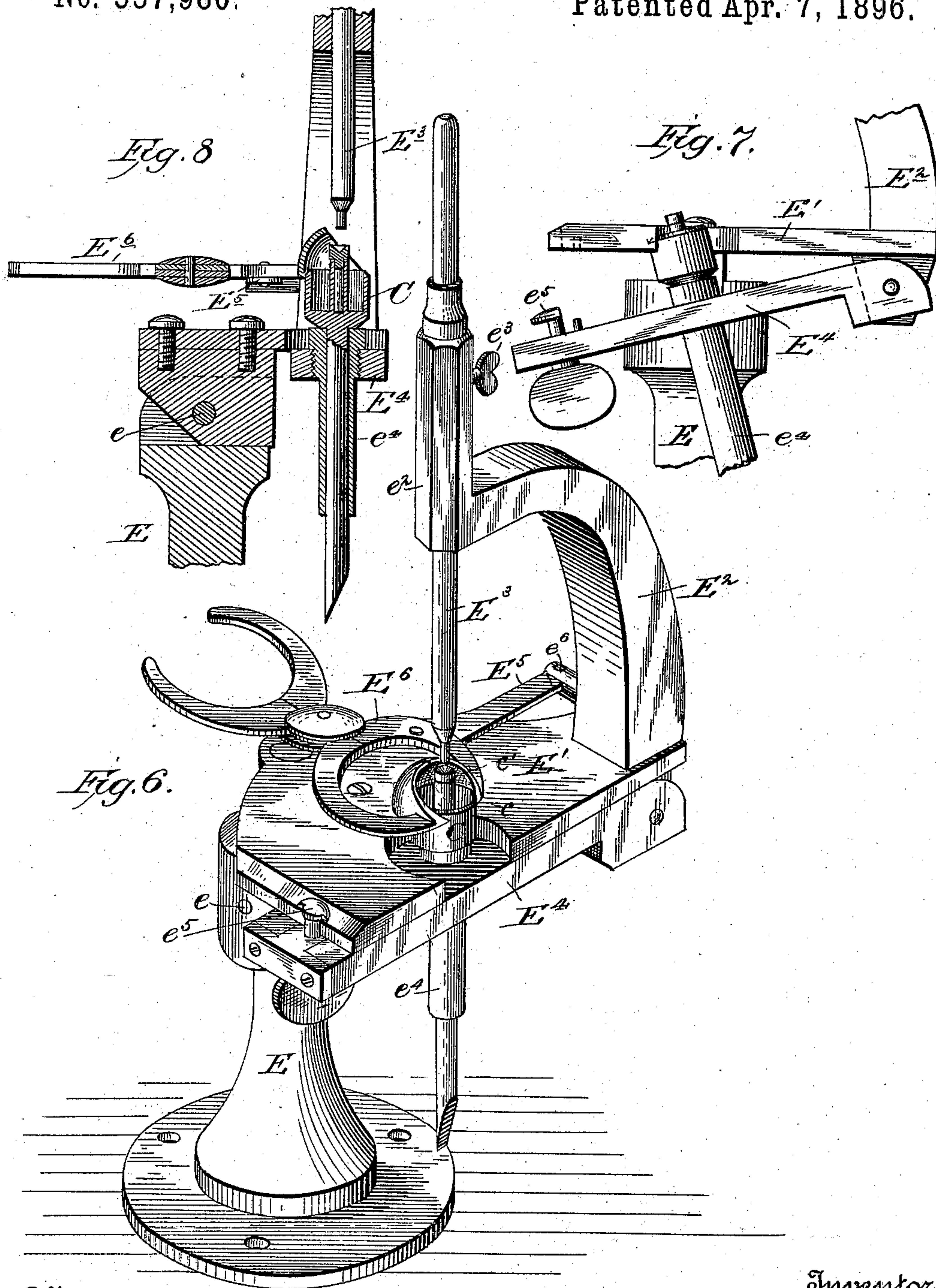
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Witnesses
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UNITED STATES PATENT OFFICE.

JOHN EDWARD EVARD, OF INDIANAPOLIS, INDIANA.

METHOD OF AND APPARATUS FOR GRINDING AND POLISHING PRECIOUS STONES.

SPECIFICATION forming part of Letters Patent No. 557,980, dated April 7, 1896.

Application filed April 23, 1895. Serial No. 546,877. (No model.)

To all whom it may concern:

Be it known that I, JOHN EDWARD EVARD, a citizen of the United States, residing at Indianapolis, in the county of Marion and State of Indiana, have invented certain new and useful Improvements in Methods of and Apparatus for Polishing and Grinding Precious Stones; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

In grinding and polishing diamonds experience has taught that several conditions are necessary for practical success. These conditions are such that the work requires a high degree of skill in execution, and can be prosecuted only with great care and very slowly, and consequently at great expense.

I am aware that many attempts have heretofore been made to provide mechanical means which would in a large measure displace or render unnecessary the skill of the lapidary before required and thereby reduce the expense of polishing; but these conditions requisite to practical success have not been all secured in these machines, and they have not, therefore, been adopted for nor put into practical use. The only practically successful method of holding a stone while being ground or polished, so far as known, is by molding or embedding it in fusible metal, with only a small portion of its surface—but little more than the facet to be polished—exposed. The stone is thus held absolutely rigid in the dop (as it must be to secure the best results) and enabled to withstand the tendency to tear loose from its fastenings under the strain from the friction of the operation. As each facet (or each small exposed section, sometimes two facets) is polished, the fusible metal is melted, the stone shifted in its position on the dop to bring another section into proper position to be polished, and the metal again molded around it, to almost entirely embed it and render it secure against the possibility of any motion on its seat. This shifting of the stone to the positions required for perfect results necessitates skill of the highest degree, that can be acquired only by long practice and natural ability of a high order. Practical success also requires that the stones be so held

during the process that the lapidary may at any time pick them up for examination or inspection and replace them on the lap in exactly the same position they occupied before removal.

The object of my said invention is to provide means whereby the process of polishing such stones may be carried on in an improved manner, securing better results with the employment of skill of a lower order than heretofore required, and the work of each lapidary result in the polishing of a much larger number of stones in the same time, and at the same time fulfil the conditions required for practical success, as pointed out; and it consists in certain improvements in the process of securing, holding, and presenting the stones to the mechanism employed in polishing them, and in the mechanism employed, whereby these objects are accomplished, as will be hereinafter more fully described and claimed.

Referring to the accompanying drawings, which are made a part hereof, and on which similar letters of reference indicate similar parts, Figure 1 is a side elevation of a section of a bench fitted with laps for polishing diamonds, one being shown, and one of my improved holding frames or tools in the position it occupies while in use; Fig. 2, a front elevation of one of said holding frames or tools without the gage D; Fig. 3, a top or plan view of the same; Fig. 4, a longitudinal vertical section on the dotted line 4 4 in Fig. 3, the gage D being shown in the position it occupies when in use; Fig. 5, a plan view of a gage used in connection with said tool for determining the different positions of the stone while being operated upon; Fig. 6, a perspective view of a stand embodying a clamping device for holding the stone in position on the dop while being secured by molding metal around it; Fig. 7, a detail side elevation of a portion of said stand, and Fig. 8 a detail vertical section through a portion of said device.

In the drawings the portions marked A represent the lap; B, the base carrying the frame for holding and supporting the dops; C, said dops; D, the gage, and E the stand carrying the clamp and mold in which the stones are secured to the dops.

The lap A and the bench and supporting

and operating mechanism are, or may be, of any usual or desired construction and need no special description herein, being shown only to render an understanding of the features which constitute my invention more clear and complete.

The base B consists of a horizontal arm or plate of sufficient strength and rigidity, having a wide rear end, from the corners of which supporting-feet b extend down a sufficient distance to rest upon and securely support the tool in the required position on the bench. At its forward end is pivoted a frame B', consisting of an upper and lower transverse bar connected by two uprights. Said frame B' is pivoted to the base B by means of pivots b' , which extend through said uprights near their lower ends into segmental plates B², secured to the sides of the base B at its front corners. Said plates B² are substantially in the form of a quarter of a circle and have graduation-marks upon their upper edges. (See Fig. 3.) Segmental slots b^2 are formed near their outer edges and a clamping-screw B³ extends through each of said slots into a screw-threaded perforation formed in a rearwardly-projecting ear b^3 on the upper end of each of the uprights of the frame B'. Sleeves B⁴, for holding the dops, are mounted vertically in said frame B', the lower end of each sleeve extending through a suitable perforation in the lower transverse bar of said frame and connected at its upper end by a screw-threaded connection to a thumb-nut B⁵, which is mounted in the upper transverse bar of said frame. Said thumb-nuts are formed with circumferential grooves, in which are fitted collars b^5 , with a smaller perforation than the perforation in the main bar of the frame, which collars are secured to said bar by any suitable means. In Figs. 2 and 3 I have shown said collars in the form of a continuous divided plate secured on the top of said frame B' by screws. In lieu of said construction the nuts may be formed in two sections connected by small screws and the plate or collar formed in one piece, as indicated in Fig. 4. By this arrangement the turning of the thumb-nut will adjust the sleeve with which it is connected, while at the same time said sleeve is held rigidly in said frame, being prevented from turning therein by means of a small set-screw b^6 , inserted through the lower bar of the frame B' and engaging with a vertical slot in its rear side. Near the lower end of each of said sleeves is formed a transverse perforation, preferably rectangular in cross-section and with slightly-tapered walls, in which is mounted a correspondingly wedge-shaped clamping-bolt B⁶, having a perforation b^7 , which registers with the vertical perforation in the sleeve. A thumb-nut B⁷ is provided on the outer end of said clamping-bolt, by which it is operated.

The dops C are preferably formed of steel, and each consists of a spindle of sufficient length to extend up through the frame B' and

one of the sleeves carried thereby, bearing upon its lower end a cup of a size sufficient to support the metal to be molded around the stone, and has a central stud c projecting a short distance beyond the edge of said cup. Said stud is provided with a central perforation in which is mounted a tip c' , formed of copper or other soft metal, capable of withstanding the heat required to manipulate the fusible metal used in holding the stone. Said tip is formed with a short shank to support it in the stud c , and an enlarged end, with its outer face cup-shaped, which may be of any size or angle required by the size of the stone to be operated upon. The shank or spindle for insertion in the hollow stud is of the same size in all cases and thus adapted to fit and be used with any dop. The upper end of the shank of said dop is formed with a long flat tapered side, as shown most plainly in Fig. 4, for a purpose which will be presently described. Said shank is inserted in one of the sleeves B⁴, through the perforation b^7 in the clamping-bolt B⁶, and secured therein by means of said clamping-bolt, which is drawn to clamp it as securely as required by means of the nut B⁷.

The gage D consists of a disk provided with graduation-marks at its outer edge, the circle being divided into that number of parts which will enable the number of facets to be formed in each row to be determined, such number usually being thirty-two for the top and twenty-four for the lower side of the stone, which number may be divided into sixteen, twelve, eight, and six, the number of facets to be formed in different rows on the different sides of the stone. On the under side of said disk, in its center, a socket D' is provided, the interior of said socket being formed to exactly fit the tapered upper end of the spindle of the dops. This formation makes it necessary that said gage shall always be placed upon said spindle in the same position.

The stand E and the parts mounted thereon, as illustrated in Figs. 6, 7, and 8, constitute the subject-matter of another application, Serial No. 552,955, and is not therefore claimed herein, but is shown and briefly described that the use of the process and devices forming the subject-matter hereof may be better understood. It consists of a suitable base having hinged to it, by means of a pivot e , a horizontal plate E', which carries upon one end a curved upright E², which terminates at its top in a sleeve e^2 , having a central perforation, in which is mounted a clamping-rod E³, which may be secured in any position therein by means of a thumb-screw e^3 , mounted in a screw-threaded perforation in the side of said sleeve and adapted to impinge at its inner end upon the side of said rod. The central portion of the plate E' is cut away, and a bar E⁴, carrying a sleeve e^4 , is pivoted at one end to the under side of said plate E' and may be secured in the position shown in Fig. 6 by a button e^5 , mounted upon the outer

end of said plate E^4 and adapted to engage with the edge of said plate E' , and when turned half around securely lock the two plates together. When in such position, the
 5 perforations in the sleeve e^2 and sleeve e^4 are exactly in line. An arm E^5 is pivoted to a stud e^6 on one side of the standard E^2 and has a mold E^6 , consisting of two concave parts of suitable form, to fit around the top of a dop,
 10 each carried on one end of a handle or lever, which are pivoted together—the usual “scissors-like” construction—pivoted to its outer end in that position which will enable said mold to be opened and closed around the up-
 15 per end of one of the dops when mounted in the sleeve e^4 .

It will be noticed that the apparatus above described is constructed and arranged to carry three dop-supporting sleeves, and consequently is adapted for polishing three stones at one time; but, as will be understood, of course, the base and frame may be made to carry any other number desired, as I claim any tool or frame adapted to carry or support
 25 more than one dop in such a manner that each is adapted to be adjusted, indexed in relation to the facets of the stone carried thereby, and manipulated independent of its companion dops. By this invention, while the frame or
 30 tool is adapted to carry a multiple of stones, yet each is so held or supported that it may be independently indexed and manipulated and be secured to its dop by the well-known means of embedding it in fusible metal, ex-
 35 cept the facet to be polished, and the advantage of a multiple tool secured without the security of the stone in its seat being lessened in any degree. By my method of changing the metal around the stone when it is desired
 40 to change from one facet to another the stone is maintained in the same position in relation to its dop-spindle throughout the polishing of each side, and consequently each dop and stone may be removed and replaced in the
 45 tool as many times as desired (the proper position being determined by the gage, as described) without danger of disturbing the order or symmetry of the facets. Each stone being thus manipulated without reference to the others, although their relations to each other are known and maintained, it is possible to use as many dops as found desirable in one frame or tool.

In operation the soft-metal tip c' is placed
 55 in the hollow stud c within the cup of the dop. Said dop is placed in the sleeve e^4 in the plate E^4 of the stand or clamping device E . Said plate E^4 is then swung to and locked in the position shown in Fig. 6. The stone to
 60 be polished is placed in the cup-shaped face of the tip c' , with its table and cullet in exact line with the center of the spindle of the dop and the clamping bar or rod E^3 . Said rod E^3 is then pressed down upon the upper
 65 surface of the stone until its lower side is slightly indented or impressed in the soft-metal tip, when the set-screw e^3 is turned to

firmly secure the part in this position. The plate E' is then tilted on the stand, so that that portion of the stone which it is desired
 70 to expose for polishing shall be brought uppermost, the dop having previously been inserted with the side of the stone in that position which renders this possible. The mold is then brought around the top of said dop
 75 closely and the metal turned in and allowed to cool, which secures the stone, as desired, by the old and well-known means. The stones having been thus mounted in the dops, said dops are then mounted in the sleeves of the
 80 frame B' and firmly clamped therein, as before described. The angle required to polish the facet desired having been determined by means of the graduation-marks on the edges of the segmental plates B^2 , the position of
 85 said facet is determined by the gage D being placed upon the upper end of the spindle of each of said dops and the dop turned thereby until the mark which determines the proper position (well known to the lapidary) registers
 90 with the index-finger b^8 , which extends up from the top bar of the frame B' exactly in front of each of said spindles. As the grinding of the corresponding facets of the several stones in each frame proceeds the lapidary
 95 is enabled to examine and inspect the work, whenever he so desires, by picking up the tool, as is common. As will be understood, but little more of his time is employed in inspecting three or four stones carried by the
 100 same tool than would be required for one, and he is thus enabled to attend to the polishing of a much larger number of stones than by the old method without being deprived of any of the customary means for carrying on the work. Should the facet being
 105 ground upon one stone be found to require a little more grinding than the corresponding facets of its companion stones, in order to remove a slight flaw, as is sometimes found necessary, the desired result can be accomplished
 110 by adjusting the sleeve B^4 , carrying the dop containing the stone, by means of the nut B^5 , so that said facet will receive the required polishing for the purpose without grinding
 115 the facets of the companion stones any more than desired. The feet b on the rear end of the frame B are so far apart that the adjustment of one or more of the dops to lift or remove one or more stones from the lap does
 120 not in any manner impair the security or steadiness of the tool.

When one set of facets has been ground or polished to the degree desired, the dops are removed, placed in the stand or clamping-
 125 frame E , as before described, the clamping-bar E^3 brought down firmly upon the stone to prevent it from moving in the slightest from its position, the frame is then tilted to bring that portion of the stone which it is desired
 130 to expose next uppermost, the mold placed in position around the dop, and a jet of flame directed against the fusible metal in the well-known manner, which causes said metal to

melt and run down around the other portions of the stone, exposing the spot desired. The fact that the side of the stone which rests in the tip *c'* has its corners slightly embedded therein insures that there shall be no movement of the stone during this operation, (it being understood that said tip *c'* is made of metal—copper, for example—not affected by the heat required to melt the metal in which the stone is held,) and also adds greatly to the security of the stone after said fusible metal has cooled, as will be readily seen. The stones having been treated to expose the desired facets, the dops are again inserted in the frame or tool. The lapidary, by means of the gage *D*, knows the exact position of the facet last polished, and by means of said gage is enabled to determine with mathematical exactness the position of the next facet which it is desired to polish, which positions are successively determined and the dops clamped, as before described. The lamps which hold said dops in said frame being located near the lower end thereof, close to the lap, are enabled to hold said dops with great security.

As will be readily understood, the metal can be changed around the stones by the means and method described with the exercise of much less skill than required to adjust the stones in the dops, (as formerly done,) which permits a cheaper class of labor to be employed for this purpose and allows the skilled lapidary to devote his entire time to the care and inspection of the stones being polished, the dops being made ready with one set of stones while he is polishing other sets.

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

1. The process of grinding or polishing diamonds which consists in securing the stone to its seat on the dop or holding device by embedding it in fusible metal except that part of its surface first to be operated upon, polishing said part, then applying heat to said fusible metal of sufficient degree to melt it, tilting said dop so that said metal will run from the part next to be operated upon and around the part that was last operated upon, polishing the part thus exposed, and continuously repeating the operation until the polishing is completed, whereby each side of said stone is polished without changing its position in relation to its seat, substantially as set forth.

2. The process of polishing diamonds which consists in securing said stones to their seats by pouring molten metal around them to cover all but the portion of their surfaces which it is desired to operate upon first, allowing said metal to cool, then polishing the exposed surface, then melting the metal and allowing it to run off the portion of the surface next to be polished and around the portion last polished and again allowing it to cool, then polishing the portion of the surface thus exposed, and repeating the operation until the desired work has been accomplished,

substantially as described and for the purposes set forth.

3. In an apparatus for polishing diamonds, the combination of a base, a frame hinged to the front end of said base, several sleeves mounted in said hinged frame and a dop mounted in each sleeve, the spindle of each dop being formed with a cut or angle on one side of its top, and a disk with a socket formed to fit said spindle for turning it in said sleeve, substantially as set forth.

4. In an apparatus for polishing diamonds, the combination, of a base, a frame hinged to the front end thereof, a number of sleeves mounted in said frame to be adjusted therein in the direction of their lengths, a dop secured in each of said sleeves to be carried thereby, and adapted to be rotated therein, each of said dops being mounted to be rotated independent of the other dops, substantially as set forth.

5. In an apparatus for polishing diamonds, the combination, of a suitable frame, a number of dops mounted in suitable bearings in said frame, each of said dops being adjustable in the direction of its length and also rotatable in its bearing, and not connected to any other dop, whereby each may be adjusted and rotated to index and manipulate the stone carried thereby entirely independent of the others, and means for securing each dop in the adjusted positions, substantially as set forth.

6. A tool for holding diamonds while being polished consisting of a suitable base, a frame hinged to its front end, means for securing said frame at the desired angle, sleeves mounted in said frame, means for independently adjusting said sleeves, and a dop in each of said sleeves, whereby a multiple of stones are held in a single tool and capable of independent manipulation, substantially as set forth.

7. In a tool for holding diamonds while being polished, the combination of the base consisting of an independent structure with a wide rear end having supporting-feet extending down from its corners, which with the points or stones resting on the lap constitute the supports for said tool, a frame hinged to the front end of said base and adapted to be adjusted to different angles therein, several sleeves mounted in said frame to be adjusted therein in the direction of their length, and a dop in each of said sleeves, substantially as set forth.

8. The combination with a tool for holding precious stones while being polished, of a dop in which said stones are secured, said dop being provided with a tip of metal softer than that of the dop proper upon which the stones are secured, substantially as set forth.

9. In a tool for holding precious stones while being ground or polished, the base, *B*, provided with segmental plates, *B*², at its front corners, the frame, *B*¹, pivoted to said segmental plate, the set-screws, *B*³, extending through segmental slots in said plates and engaging ears formed on said frame, *B*¹, contiguous

uous to said plates, the sleeves, B⁴, mounted
to be vertically adjustable in said frame, B',
the clamping-bolt, B⁶, in the lower end of each
of said sleeves, and the dop, C, mounted in
5 each of said sleeves and secured therein by
said clamping-bolt.

10. In a tool for holding precious stones
while being polished, the combination of the
dop-holding frame, said dop, the spindle
10 whereof is formed with a tapered upper end,
the gage, D, formed with a socket correspond-

ing to the shape of the upper end of said spin-
dle, and an index-finger provided on said dop-
holding frame in position to register with said
gage, substantially as set forth.

In testimony whereof I affix my signature,
in presence of two witnesses, at Indianapolis,
Indiana, this 15th day of April, A. D. 1895.

JOHN EDWARD EVARD.

Witnesses:

CARL F. WALK,
WILLIAM W. HEROD.