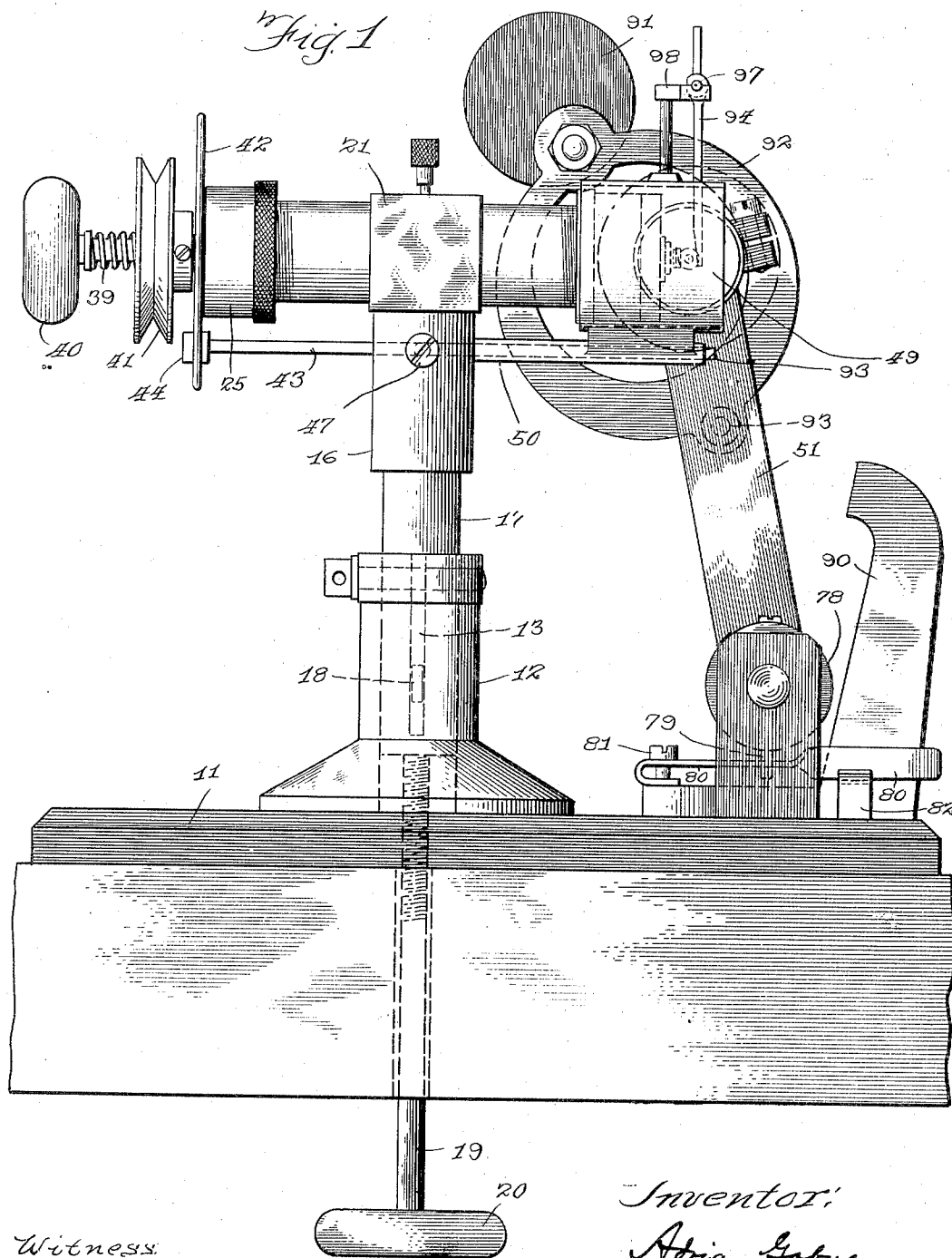


A. GABUS.
JEWEL MAKING MACHINE.
APPLICATION FILED DEC. 2, 1916.

1,302,908.

Patented May 6, 1919.

3 SHEETS—SHEET 1.



Witness
L. B. Graham

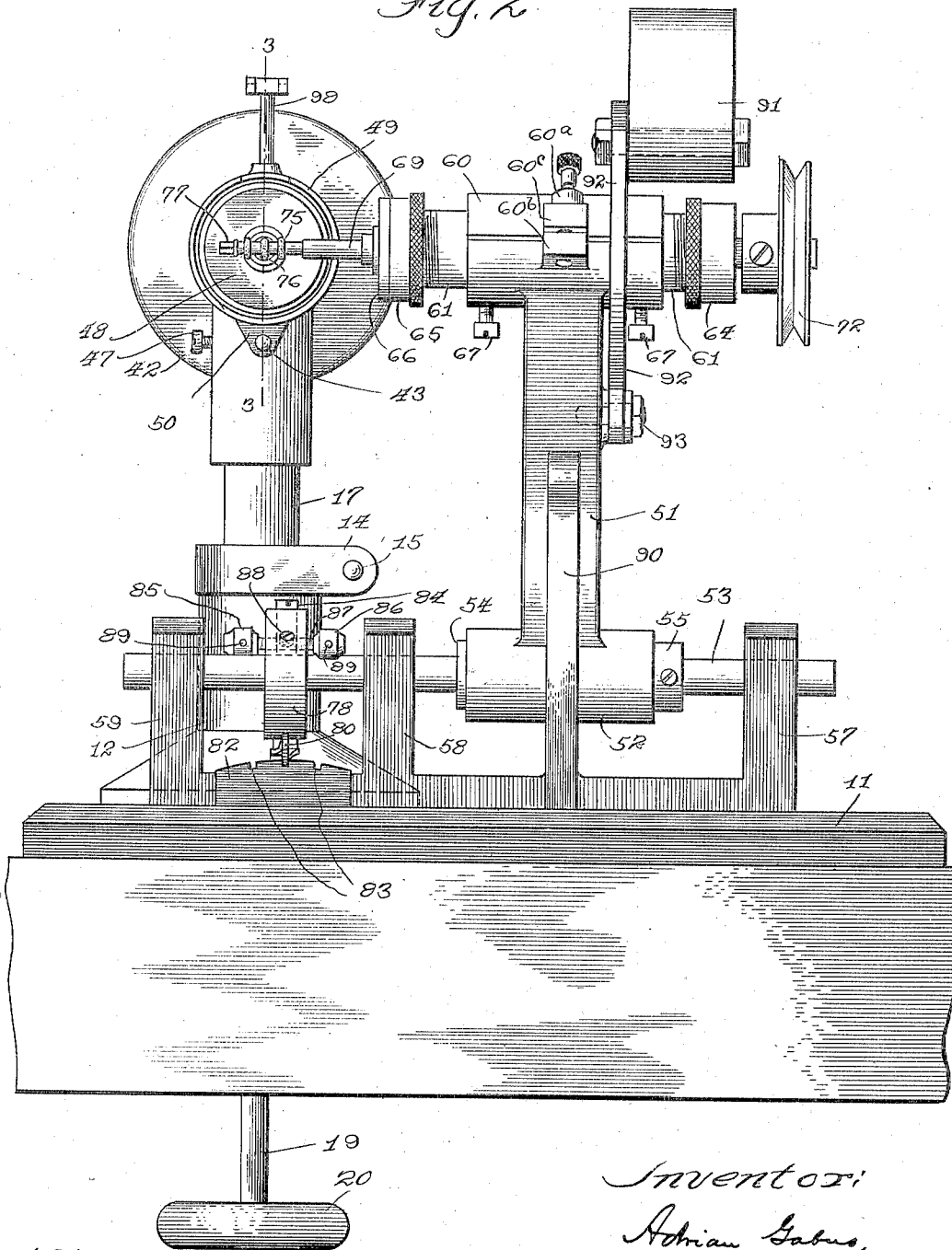
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Fig. 2



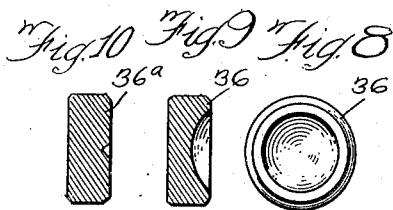
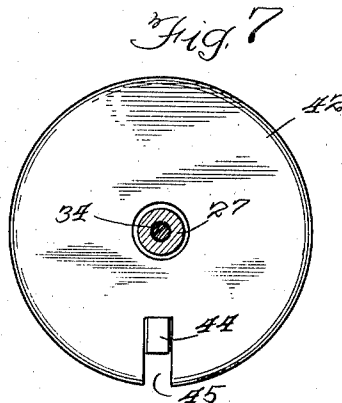
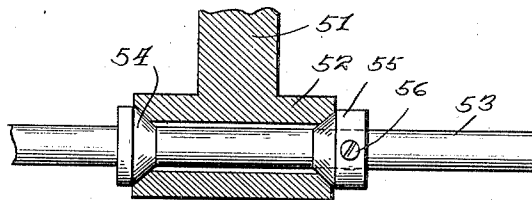
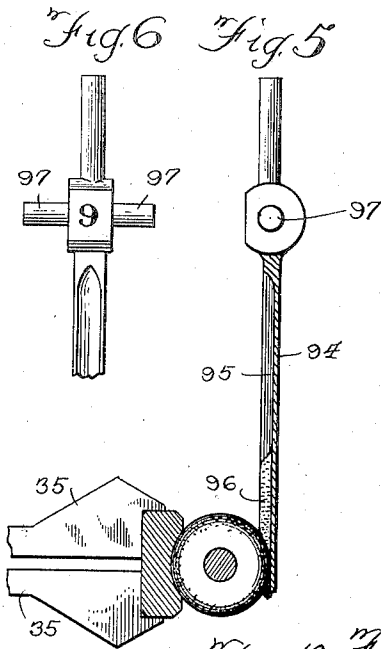
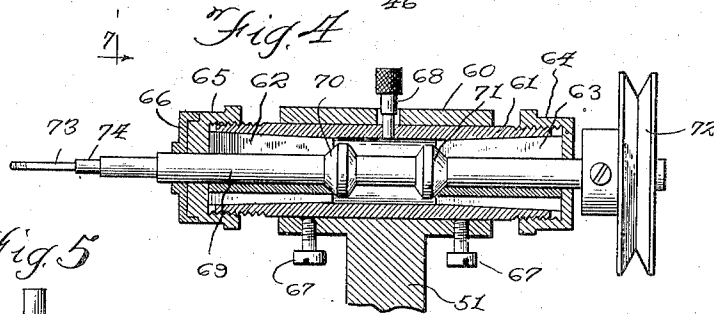
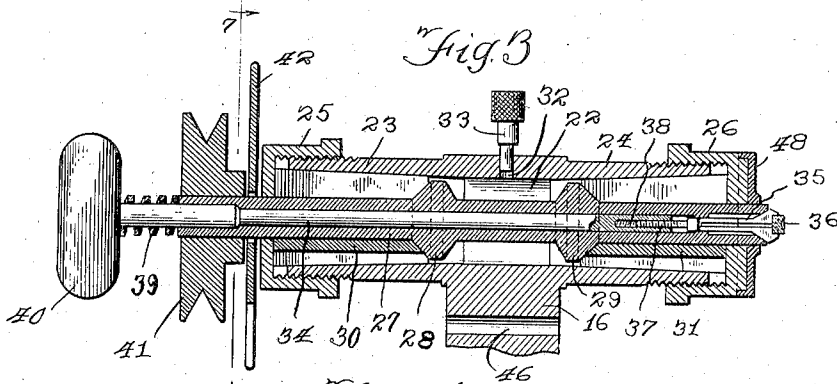
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3 SHEETS—SHEET 3.



Witness
L. B. Graham

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by Adams & Jackson,
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UNITED STATES PATENT OFFICE.

ADRIAN GABUS, OF SPRINGFIELD, ILLINOIS.

JEWEL-MAKING MACHINE.

1,302,908.

Specification of Letters Patent.

Patented May 6, 1919.

Application filed December 2, 1916. Serial No. 134,634.

To all whom it may concern:

Be it known that I, ADRIAN GABUS, a citizen of the Republic of Switzerland, and a resident of Springfield, in the county of Sangamon and State of Illinois, have invented certain new and useful Improvements in Jewel-Making Machines, of which the following is a specification, reference being had to the accompanying drawings.

My invention relates to the manufacture of jewels such as are used for the bearings of chronometers, electricity meters, and other delicate instruments. One of the materials commonly used for such jewels is sapphire, but various other precious or semiprecious stones are also used for the purpose. In my application Serial No. 134,633 for patent of even date herewith, for improvements in jewel-blank shaping-machines, I have illustrated and described a machine for fashioning thin slabs of sapphire or other suitable material into cylindrical form preparatory to their being further treated in the manufacture of the finished jewel. My present application has to do with a machine for cupping, rough polishing and finishing the blanks to produce the completed jewel ready to be set. It will be understood that cupped jewels as commonly used are cylindrical in form, one side being flat and the other provided with a semi-cylindrical or concave recess which forms a pivot bearing. These jewels must fit exactly the sockets in which they are set and their cups must be shaped and positioned with absolute accuracy and must also be perfectly smooth in order to provide a substantially frictionless and true bearing for the pivot mounted therein. As they are very small the work of properly cupping and polishing them is very delicate. Attempts have heretofore been made to produce satisfactory machines for the purpose in order to reduce the expense of manufacture and to standardize the product, but so far as I am aware no satisfactory machine for the purpose has heretofore been produced. One of the great difficulties has been that the machines heretofore employed for the purpose have left what is known as a "dead" spot, or slight central depression in the center of the cup, so that the cup was not truly spherical, and consequently the friction and wear on the pivot mounted in such

cup was excessive. Furthermore, a satisfactory machine for the purpose must be so constructed as to be capable of very accurate adjustment and of operating for a considerable period of time without variation or deviation from the position in which it is set so that a comparatively large number of identical jewels can be produced without readjusting the machine, otherwise the machine could not be successfully operated by comparatively inexperienced operators or be economically used even by expert operators. To provide a machine which will successfully meet all the exacting conditions of this work and which will produce jewels having a truly spherical cup without a dead spot, is the object of my invention. I accomplish this object as illustrated in the drawings and as hereinafter described. That which I believe to be new is set forth in the claims.

In the accompanying drawings,—

Figure 1 is an elevation of the machine from one side;

Fig. 2 is an elevation at right angles to that of Fig. 1, looking to the left;

Fig. 3 is a partial longitudinal section taken on line 3—3 of Fig. 2;

Fig. 4 is a longitudinal vertical section of the tool-supporting member or frame, partially broken away;

Fig. 5 is a sectional view showing the manner in which the jewel blank is supported,—the lap, and the devices for supplying the abrasive being in operative position.

Fig. 6 is a view taken at right angles to that shown in Fig. 5, illustrating the construction of the device for carrying and feeding abrasive to the lap;

Fig. 7 is a detail, being a vertical cross-section on line 7—7 of Fig. 3;

Fig. 8 is a front view of a completed jewel; Fig. 9 is a sectional view of the jewel shown in Fig. 8; and

Fig. 10 is a sectional view of a jewel blank before it has been cupped.

The machine which forms the subject-matter of this application is similar to that shown and described in my companion application hereinbefore referred to in that it comprises two principal members, one being normally stationary and provided with a rotating mandrel or shaft by which the work is supported, the other member, which car-

ries a rotating shaft in which the lap is mounted, being adapted to swing to move the lap toward and from the work on which it operates. In the machines of both applications both the shafts referred to—*i. e.*, that which carries the work and that which carries the lap—are mounted in extended bearings which are inclosed and protected from dust, and the housings of both shafts are arranged to receive a quantity of lubricant which is automatically supplied to said bearings. There are also a number of other points of similarity which need not be pointed out specifically; I wish it to be understood, however, that the claims hereinafter made are directed particularly only to features of construction and operation that are not included in the subject-matter specifically claimed in my said companion application.

Referring to the drawings, in which is illustrated the preferred embodiment of my invention,—11 indicates the base of the machine, and 12 a tubular pedestal secured upon the base in any suitable way. As indicated by dotted lines in Fig. 1, said pedestal is provided with a vertical passage therethrough which is circular in cross-section, and extending downward from the upper end of said pedestal is a slot 13 which is also indicated by dotted lines in said figure. This slot extends downward a considerable distance, and its purpose is to permit the upper portion of the pedestal to contract and expand slightly so that it may operate as a clamp, as hereinafter described. At one side, near its upper end and at opposite sides of the slot 13, the pedestal 12 is provided with lugs 14, one of which is shown in Fig. 2, the arrangement being such that by passing a bolt 15 through said lugs, one of which is screw-threaded, the upper portion of the passage through the pedestal may be expanded or contracted, for the purpose stated. 16 indicates a standard, which is provided with a stem 17 of reduced diameter adapted to fit telescopically in the bore or passage of the pedestal 12 so that the standard may be adjusted vertically with regard to the pedestal. By means of the clamping bolt 15 the pedestal may be clamped tightly upon the stem 17 to hold the stem against vertical movement. The stem 17 is prevented from rotating in the pedestal by means of a feather 18 which fits in the slot 13, as shown in dotted lines in Fig. 1. 19 indicates an adjusting screw having a handle 20, said screw being fitted in a suitable screw-threaded bearing in the base 11 disposed concentrically with reference to the axis of the pedestal 12. The upper end of said screw bears against the lower end of the stem 17, so that by means of said screw the standard 16 may be raised. To lower the standard, the screw 19 is moved down out of contact with the stem 17, when the stem

may be pressed down in its socket. By this construction a very fine vertical adjustment of the standard may be obtained. 21 indicates a hollow block carried at the upper end of the standard 16 and containing a chamber 22, as shown in Fig. 3. 23—24 indicate horizontal sleeves which extend in opposite directions from the ends of the chamber 22, as shown in Figs. 1 and 3. The outer end portions of these sleeves are provided with screw-threads to receive deep cup-like caps 25—26, respectively, which fit upon them, as best shown in Fig. 3. 27 indicates a shaft or mandrel which extends longitudinally through the sleeves 23—24 and the chamber 22 and also through the caps 25—26, said caps being perforated centrally to fit closely upon said mandrel, as shown in Fig. 3. The sleeves 23—24 are conical internally, their larger diameters being at their outer ends. 28—29 indicate oppositely-disposed conical members carried by the mandrel 27 at points corresponding approximately with the opposite ends of the chamber 22, and preferably formed integral with the mandrel. 30—31 indicate two similar tubular bearings which are split longitudinally and are preferably provided with longitudinal grooves at suitable intervals, as described in my application hereinbefore referred to. As best shown in Fig. 3, the tubular bearings 30—31 are tapered externally, and at their inner ends they are beveled to fit closely against the opposed conical bearing surfaces of the members 28—29. The caps 25—26 bear against the outer ends of the tubular bearings 30—31 and hold them properly seated and also provide for adjusting them to take up wear. As the mandrel 27 rotates oil in the chamber 22 is carried up by the conical members 28—29 and passes through the longitudinal slits in the tubular bearings 30—31, thereby lubricating the bearing surfaces of the mandrel 27. 32 indicates an opening through which lubricant may be supplied to the chamber 22, and 33 indicates a cap for said opening. 34 indicates a shaft which extends through the mandrel 27 and is movable longitudinally therein. At the right-hand end of said shaft in the illustration in Fig. 3 it carries a collet or expansible chuck 35 having a socket in its outer face to receive a jewel blank 36. The collet is adjustably connected with the shaft 34 by means of its screw-threaded stem 37 which fits in a threaded socket 38 in the right-hand end of the shaft, as shown. A spring 39, mounted on the opposite end portion of the shaft 34 between the adjacent end of the mandrel 27 and a handle 40, operates normally to move the shaft 34 to the left, thereby holding the collet 35 in its operative or clamping position, since then the collet is drawn back partly within the adjacent end of the mandrel, which operates to press its

jaws together. By pressing upon the handle 40 so as to move the shaft 34 to the right, the collet is automatically expanded and the jewel released. In the construction shown, the mandrel 27 is rotated by a pulley 41 mounted upon it near its left-hand end, said pulley being driven by a belt from any suitable source of power, but any other suitable means for rotating the mandrel may be employed. For conveniently stopping the rotation of the shaft 34 and the mandrel 27 which carries it and with which it rotates, I provide a brake-disk 42, which is loosely mounted upon the mandrel between the pulley 41 and the cap 25, as shown in Fig. 3. This brake-disk is of somewhat larger diameter than the pulley 41 and is held against rotation by means of a bar 43 having a squared head 44 which fits in a slot 45 in the lower portion of the disk 42, as shown in Figs. 1 and 7. The bar 43 is fitted in a suitable transverse passage 46 in the upper portion of the standard 16, as best shown in Figs. 1 and 3 and is adjustably secured therein by means of a set-screw 47. Thus the bar 43 may be shifted longitudinally, if desired. Since the brake-disk 42 is held against rotation as above described, it will be apparent that the operator by placing the palm of his hand against the handle or knob 40 and grasping the disk 42 with his fingers, can move the shaft 34 longitudinally to release the jewel, and at the same time can draw the brake-disk 42 into frictional engagement with the hub of the pulley 41, thus putting a brake upon the pulley, mandrel and shaft, by which their rotation may be stopped very quickly. As will hereinafter more clearly appear, this makes the work of removing a completed jewel and replacing it with a fresh blank very expeditious and convenient, since the same operation that releases the finished jewel brings the shaft and mandrel to a stop so that a fresh blank may be applied to the collet. An important function of the caps 25—26 is to inclose the bearing surfaces of the mandrel and prevent the admission of diamond dust or other abrasive which would tend to wear out the bearings rapidly. At the collet end of the mandrel, where the dust is thickest, an additional cap 48 is provided which is fitted tightly upon the mandrel and partly overlies the cap 26. The cap 48 rotates with the mandrel, and as it fits closely upon the cap 26, it prevents dust from passing between said cap and the mandrel, and also, by its rotation, prevents the dust from entering between the two caps 26 and 48. This feature has been fully illustrated and described in my aforesaid application.

49 indicates a cylindrical guard which overlies the cap 26 and extends laterally a short distance beyond the work, as shown in Fig. 1,—the purpose of this guard or shield being to prevent the abrading material from

being thrown off into the surrounding atmosphere, and also to collect such material so that it may be recovered for use. The guard 49 is supported by the bar 43, being provided with a sleeve 50 which fits upon the right-hand end of said bar, as shown in Figs. 1 and 2. The guard may easily be removed, when desired, by slipping the sleeve 50 off of the bar 43, on which it is held by friction. The guard 49 is slotted at one side to admit the shaft hereinafter described which carries the lap.

51 indicates an arm arranged to rock in a plane parallel with the axis of the mandrel 27, but offset with reference to the standard 16. The arm 51 is provided at its lower end with a sleeve 52 mounted upon a shaft 53, the ends of said arm being engaged by opposite cones 54—55 on said shaft. One of said cones is preferably fixed on the shaft and the other is removably secured thereto by a set-screw 56, as shown in Fig. 4, to permit of the removal of the shaft when necessary. The cones 54—55 form bearings for the ends of the sleeve 52, and the adjustability of the cone 55 also provides for taking up wear. The shaft 53 is mounted in suitable bearings in standards 57—58—59, said standards rising from the base 11, as shown in Fig. 2. The shaft 53 is movable endwise in its bearings, for a purpose which will hereinafter be pointed out. At its upper end the arm 51 carries a head 60 in which is fitted a tubular housing 61, the end portions of which are conical and carry tubular bearings 62—63 similar to the bearings 30—31. In like manner the ends of the housing 61 are provided with caps 64—65 similar to the caps 25—26. Caps 66 are also provided similar to the cap 48. 67 indicates adjusting-screws for slightly adjusting the housing 61 to maintain the horizontality of the lap-carrying shaft hereinafter described. This slight adjustment is permitted because, as shown in Fig. 2, the head 60 is split longitudinally, its free edges being clamped together by a screw 60^a fitted in lugs 60^b—60^c in substantially the same manner as the screw 15 is fitted in the lugs 14. By loosening the screw 60^a and removing cap 65 and the cap 68 which closes the opening through which lubricant is admitted to the interior of the housing 61, said housing may be withdrawn from the head 60. 69 indicates a shaft which is mounted in the bearings 62—63 in substantially the same way as the mandrel 27 is mounted in its bearings,—said shaft being provided with conical bearings 70—71 which cooperate with the tubular bearings 62—63 in substantially the same way as that described in connection with bearings 28—29. 72 indicates a pulley mounted on the shaft 69 for rotating the same, but any other suitable means may be employed for the purpose. At its opposite

end the shaft 69 is provided with a spindle 73 having screw-threads at its outer end and a shoulder 74 at its base. This spindle is adapted to receive one or more laps 75 separated by collars 76, as shown in Fig. 2,—the whole being secured upon the spindle by a nut 77. If the machine is intended to perform the three operations of cupping, rough grinding, and polishing, it is provided with three laps made of suitable materials, all arranged on the spindle 73 in the manner shown in Fig. 2. If only two operations are to be performed, two laps will be provided, arranged in a similar manner; whereas, if a single operation only is to be performed, only one lap need be used. Each of these laps is of a diameter corresponding with that of the cup to be formed and is arranged to be pressed against the outer face of the blank held by the collet 35 so that the lap by its rotation either grinds away the blank to form a cup-like depression in it or polishes the depression already formed by a previous operation, as the case may be. The rocking arm 51 upon which the lap-carrying shaft is mounted operates to carry the lap toward and from the work, and it will be apparent that when two or more laps are carried by said shaft, in order to bring the appropriate lap into operative position, it is necessary to move the lap-carrying shaft longitudinally. It has been explained that the shaft 53 is movable longitudinally in its bearings, and the purpose of this is to provide for shifting the lap-carrying shaft longitudinally to enable the appropriate lap to be used on the blank being operated upon. For the purpose of moving the shaft 53 longitudinally and holding it in the different positions to which it may be adjusted, said shaft is provided with a disk-like head 78, on the lower margin of which projects a pin 79, shown in dotted line in Fig. 1. 80 indicates a lever mounted upon a pivot 81 secured to the base 11 so that said lever may swing laterally. The pin 79 enters a hole in said lever, and consequently, by moving said lever laterally, the shaft 53 may be moved longitudinally of itself. The lever 80 is locked in its different positions of adjustment by a locking-plate 82 having notches 83 adapted to be engaged by the lower edge of the lever, which, in the construction shown, is twisted for that purpose and is sufficiently elastic to enable it to be sprung up out of the notches 83 when necessary. In the construction shown the locking-plate 82 is provided with three notches corresponding in position with the three laps mounted on the spindle 73, but the locking-plate may be provided with any suitable number of notches to correspond with the laps used. The head 78 is adjustably mounted on the shaft 53 and is held in position by a set-screw 84, shown in Fig.

2. Said head is also provided with adjustable stops 85—86 mounted on the ends of a screw-threaded rod 87 which passes through a suitable hole in the head 78 and is secured in place by a set-screw 88 so that it may be adjusted therein. Set-screws 89 in the stops 85—86 lock them in position on the rod 87. The stops 85—86 are adapted to strike the standards 59—58, respectively, when the shaft 53 has been moved in one direction or the other to a predetermined extent, and said stops are so placed that they stop the shaft 53 when the lever 80 comes into alinement with the end notches 83.

90 indicates a fixed stop carried by the base 11 for limiting the backward movement of the arm 51—i. e., its movement away from the work. Said stop is so placed that when the arm 51 bears against it it occupies a position inclined away from the work so that it then automatically remains in its inoperative position. In order to hold the lap in operative engagement with the work when the arm 51 is moved to its operative position, I provide a counterbalancing-weight 91 which is carried by a ring-plate 92 pivotally mounted upon a pivot 93 secured to the upper portion of the arm 51, as best shown in Figs. 1 and 2. This ring-plate extends around the head 60, as shown in Fig. 1, and bears against one side or the other of said head depending upon whether the head is in its operative or in its inoperative position. For example, when the head is in its operative position, as shown in Fig. 1, the ring-plate 92 is swung to the left, throwing the counterbalancing-weight 91 over toward the work, thereby pressing the lap against the jewel blank. When the arm 51 is swung backward to carry the head 60 out of operative position, the ring-plate 92 swings in the opposite direction so that the weight 91 is carried over to the right of the arm 51 and then operates to hold the arm 51 against the stop 90. By using the counterbalancing-weight in the manner described, the lap in operation bears against the work with a practically uniform pressure, and it therefore operates more efficiently.

In order to supply abrasive to the lap while in operation, I provide an arm 94 having a channel 95 at one side which is adapted to receive a supply of abrasive paste 96. This arm is provided with trunnions 97, preferably between its ends, as shown in Figs. 5 and 6, and such trunnions are supported in suitable bearings provided in a bracket 98 which rises from the shield 49, as shown in Figs. 1 and 2. The bearings of the bracket 98 are so positioned that the lower end of the arm 94 extends opposite to the rear portion of the lap in use, the lap entering the channel 95, as shown in Fig. 5. Thus the abrasive is supplied to the lap as it rotates. When the supply of abrasive in the channel 95 has been consumed, it may easily

be replenished by removing the arm 94, or another arm 94 may be substituted for the empty one. This also makes it very easy to change the abrasive, as is necessary where a different operation is performed, as different abrasives are usually employed for the different operations of cupping, rough polishing, and finish polishing.

The operation of the machine will probably be fully understood from the foregoing description, but it may be well to summarize it briefly. It will be understood that when the jewel blanks to be operated upon come from the shaping machine shown and described in my aforesaid application they are in the form of cylindrical disks with sharp edges and flat faces. The edges of the disks are then beveled slightly, and the center is marked on one face as indicated in Fig. 10, which shows the usual condition of the jewel blank when it is ready for cupping and finishing. The blank is then inserted in the collet 35 by moving the shaft 34 endwise to the right from the position shown in Fig. 3, thereby expanding the collet and permitting it to receive the blank. As soon as the shaft 34 is released, the spring 39 moves it to the left and clamps the collet upon the jewel. In the operation of moving the shaft 34 to the right, the operator simultaneously draws the brake-disk 42 into engagement with the hub of the pulley 41, thereby stopping the rotation of said shaft and pulley and also of the mandrel 27. When this occurs the belt which drives the pulley 41 slips idly over it. When the operator releases the shaft 34, the brake-disk 42 releases the pulley, which at once resumes its rotation and rotates the shaft and mandrel. The weight 91 is then manually swung forward or toward the work, rocking the arm 51 in that direction and carrying the lap-supporting shaft 69 in the same direction so as to bring one or the other of the laps into engagement with the outer surface of the blank. The first operation is that of cupping, and ordinarily the innermost lap is used for that work, in which case the lever 80 would occupy a position to the left of that shown in Fig. 2. During this operation and also the subsequent polishing the lap and the blank are both rotated at high speed about axes which intersect each other at right angles, so that the cup is made truly spherical. When the cupping operation has been completed, the shaft 69 is moved longitudinally by the lever 80 to bring the next lap into operative position, and in this way the operation of rough polishing is performed. In like manner the step of finish polishing may be accomplished as soon as the rough polishing is done. For each operation the appropriate abrasive is supplied by the abrasive-supplying device 94, and the surplus of abrasive material is collected and retained by the guard 49. The

adjustments provided for as hereinbefore described enable the operator to compensate for wear, or otherwise regulate the parts of the machine so that extreme accuracy may be obtained.

It will be understood that while I have described with considerable particularity the construction illustrated in the drawings, my invention is not limited to the specific construction shown except in so far as it is particularly claimed, but includes generically the subject-matter of the broader claims. Furthermore, so far as I know, I am the first in the art to employ the method of rotating a blank and a lap about axes which intersect each other at a right angle, in cupping or polishing the blank, and this method or mode of operation is therefore also included in my invention.

That which I claim as my invention, and desire to secure by Letters Patent, is,—

1. A machine of the class described, comprising means for supporting a blank, a lap adapted to operate on said blank, a rocking support for said lap movable toward and from the blank, and a counterbalance weight for holding said lap in operative engagement with the blank, said weight being movable into position to hold said support out of operative position.

2. A machine of the class described, comprising means for supporting and rotating a blank with one surface thereof exposed, a lap adapted to operate on said exposed surface of the blank, a rocking support for said lap movable toward and from the blank, and a counterbalance-weight for holding said lap in operative engagement with the blank, said weight being movable into position to hold said support out of operative position.

3. A machine of the class described, comprising means for supporting and rotating a blank with one surface thereof exposed, a lap adapted to operate on said exposed surface of the blank, a rocking support for said lap movable toward and from the blank, and a counterbalance-weight mounted upon said support and movable from one side to the other of the axis thereof.

4. A machine of the class described, comprising means for supporting a blank with one surface thereof exposed, a lap adapted to operate on said exposed surface of the blank, a rocking support for said lap movable toward and from the blank, and a counterbalance-weight pivotally mounted upon said support and adapted to rock about its pivot from one side to the other of the axis of said support.

5. A machine of the class described, comprising means for supporting a blank, a lap adapted to operate on said blank, a rocking support for said lap movable toward and from the blank, a ring-plate pivotally mounted on said support, and a counterbal-

ance weight carried by said ring-plate for holding said support either in operative or in inoperative position.

6. A machine of the class described, comprising means for supporting and rotating a blank with one surface thereof exposed, a lap adapted to operate on said exposed surface of the blank, a rocking support for said lap movable toward and from the blank, means adjustable to hold said support either in operative or in inoperative position.

7. A machine of the class described, comprising means for supporting a blank, a rotatable shaft, and a support for said shaft movable to carry said shaft laterally toward and from said blank, said support being adjustable to move said shaft endwise.

8. A machine of the class described, comprising means for supporting a blank, a rotatable shaft, a support for said shaft movable to carry said shaft laterally toward and from said blank, said support being adjustable to move said shaft endwise, and a lever for moving said support endwise.

9. A machine of the class described, comprising means for supporting and rotating a blank with one face thereof exposed, a rotary shaft mounted with its axis perpendicular to the axis of the blank, a support for said shaft movable to carry the same laterally toward and from the exposed face of the blank, and a lap carried by said shaft in position to peripherally engage the exposed face of the blank.

10. A machine of the class described, comprising means for supporting and rotating a blank with one face thereof exposed, a rotary shaft mounted with its axis perpendicular to the axis of the blank, a support for said shaft movable to carry the same laterally toward and from the exposed face of the blank, and a plurality of laps carried by said shaft, said shaft being movable endwise to carry one or another of said laps into position to peripherally engage the exposed face of the blank.

11. A machine of the class described, comprising means for supporting and rotating a blank with one surface thereof exposed, a rotatable shaft, a plurality of laps carried by said shaft in axial alinement with each other, and a support for said shaft movable to carry said shaft laterally toward and from said blank, said support being adjustable to move said shaft endwise.

12. A machine of the class described, comprising means for supporting and rotating a blank with one surface thereof exposed, a rotatable shaft, a plurality of laps carried by said shaft in axial alinement with each other, a support for said shaft movable to carry said shaft toward and from said blank, said support being adjustable to move said shaft endwise, and a lever for so moving said support.

13. A machine of the class described, comprising means for supporting and rotating a blank with one surface thereof exposed, a rotatable shaft, a support for said shaft movable to carry said shaft toward and from said blank, said support being adjustable to move said shaft endwise, and adjustable means for limiting the endwise movement of said shaft.

14. A machine of the class described, comprising means for supporting and rotating a blank, a lap-supporting shaft, a rocking support for said shaft adapted to carry the same toward and from the blank, a shaft upon which said support is mounted, the latter shaft being endwise movable, and means for locking the latter shaft against endwise movement.

15. A machine of the class described, comprising means for supporting and rotating a blank, a lap-supporting shaft, a rocking support for said shaft adapted to carry the same toward and from the blank, a shaft upon which said support is mounted, the latter shaft being endwise movable, and a lever for moving the latter shaft endwise and for locking it in its different positions of adjustment.

16. A machine of the class described, comprising means for supporting and rotating a blank, a lap-supporting shaft, a rocking support for said shaft adapted to carry the same toward and from the blank, said support having a split tubular head, a tubular housing mounted in said head, said shaft extending through said tubular housing, means for clamping said head on said housing, and bearings in said housing for said shaft.

17. A machine of the class described, comprising means for supporting and rotating a blank, a lap-supporting shaft, a rocking support for said shaft adapted to carry the same toward and from the blank, said support having a split tubular head, a tubular housing mounted in said head, said shaft extending through said tubular housing, means for clamping said head on said housing, bearings in said housing for said shaft, and caps closing the ends of said housing.

18. A machine of the class described, comprising means for supporting and rotating a blank, a lap-supporting shaft, a rocking support for said shaft adapted to carry the same toward and from the blank, said support having a split tubular head, a tubular housing mounted in said head, said shaft extending through said tubular housing, bearings in said housing for said shaft, and means for adjusting said housing in said head.

19. A machine of the class described, comprising means for supporting and rotating a blank, a lap-supporting shaft, a rocking support for said shaft adapted to carry the

same toward and from the blank, said support having a split tubular head, a tubular housing mounted in said head, said shaft extending through said tubular housing, bearings in said housing for said shaft, and screws extending through said head at opposite sides of the center thereof and bearing against said housing for adjusting the position thereof.

20. A machine of the class described, comprising means for supporting a blank with one face thereof exposed, a rotary shaft, a support for said shaft movable to carry said shaft laterally toward and from the blank, a spindle carried by said shaft, and a plurality of laps removably mounted on said spindle in axial alinement with each other.

21. A machine of the class described, comprising means for supporting a blank, a lap adapted to operate on said blank and movable into and out of operative relation thereto, means for supporting and rotating said lap, and means supported by said blank supporting means for supplying an abrasive to said lap while it is operating on the blank.

22. A machine of the class described, comprising means for supporting a blank, a lap adapted to operate on said blank and movable into and out of operative relation thereto, means for supporting and rotating said lap, and a member suspended on said blank supporting means above and adjacent to said lap for supplying an abrasive thereto while it is operating on the blank.

23. A machine of the class described, comprising means for supporting and rotating a blank with one surface thereof exposed, a lap adapted to operate on said blank and movable into and out of operative relation thereto, means for supporting and rotating said lap, and means held in engagement with the lap by gravity for supplying an abrasive thereto.

24. A machine of the class described, comprising means for supporting and rotating a blank with one surface thereof exposed, a lap adapted to operate on said blank and movable into and out of operative relation thereto, means for supporting and rotating said lap, and a pivotally-mounted member adapted to swing by gravity into position for supplying abrasive to said lap.

25. A machine of the class described, comprising means for supporting a blank, a lap adapted to operate on said blank and movable into and out of operative relation thereto, means for supporting and rotating said lap, and means carried by said blank supporting means and bearing against the periphery of said lap for supplying abrasive thereto.

26. A machine of the class described, comprising means for supporting a blank with one surface thereof exposed, a lap adapted to operate on said blank and movable into

and out of operative relation thereto, means for supporting and rotating said lap, and means pivoted on said blank supporting means and bearing against the periphery of said lap for supplying abrasive thereto.

27. A machine of the class described, comprising means for supporting a blank with one surface thereof exposed, a lap adapted to operate on said blank, means for supporting and rotating said lap, and a pivotally-suspended channeled member bearing by gravity against said lap for supplying abrasive thereto.

28. A machine of the class described, comprising means for supporting a blank with one surface thereof exposed, a lap adapted to operate on said blank, means for supporting and rotating said lap, and a channeled member pivotally suspended on said blank support above said lap and engaging the periphery thereof for supplying abrasive thereto.

29. A machine of the class described, comprising means for supporting and rotating a blank with one surface thereof exposed, a lap adapted to operate on said blank, means for supporting and rotating said lap, and a channeled member detachably trunnioned above said lap and engaging the periphery thereof for supplying abrasive thereto.

30. A machine of the class described, comprising a rotary member, means associated therewith for receiving and holding a blank while it is being operated on, and movable to release the same, and a friction brake adapted to be operated to stop the rotation of said blank, said brake being arranged to be operated conjointly with the releasing movement of said blank-holding means.

31. A machine of the class described, comprising a rotary mandrel, a support for said mandrel, means for rotating said mandrel, means carried by said mandrel for receiving and holding a blank while it is being operated on and movable to release the same, and a brake adapted to be operated to frictionally engage said mandrel for stopping the rotation thereof, said brake and said blank holding means being arranged to be conjointly operated to stop the mandrel and release the blank.

32. A machine of the class described, comprising a rotary mandrel, a support for said mandrel, means for rotating said mandrel, means carried by said mandrel for supporting a blank, and a brake-disk loosely mounted on said mandrel and adapted to be brought into frictional engagement therewith for stopping the rotation thereof.

33. A machine of the class described, comprising a rotary mandrel, a support for said mandrel, means carried by said mandrel for supporting a blank, a brake-member loosely mounted on said mandrel, and a pulley mounted on and connected with said man-

drel for rotating the same, said brake-member being movable into frictional engagement with said pulley for stopping the rotation of said mandrel.

5 34. A machine of the class described, comprising a rotary mandrel, a support for said mandrel, means carried by said mandrel for supporting a blank, a brake-member loosely
10 mounted on said mandrel, a pulley mounted on and connected with said mandrel for rotating the same, said brake-member being movable into frictional engagement with
15 said pulley for stopping the rotation of said mandrel, and means for holding said brake-member against rotation.

35. A machine of the class described, comprising a rotary mandrel, a support for said mandrel, means for rotating said mandrel, means carried by said mandrel for supporting a blank, a shaft mounted in said mandrel
20 and movable longitudinally thereof, a collet mounted in one end portion of said mandrel and operated by longitudinal movement of said shaft, and a friction brake-member adapted to be operated conjointly with the
25 releasing movement of said shaft to stop the rotation of said mandrel and shaft.

36. A machine of the class described, comprising a rotary mandrel, a support for said
30 mandrel, means carried by said mandrel for supporting a blank, a shaft mounted in said mandrel and movable longitudinally thereof, a collet mounted in one end portion of said mandrel and operated by longitudinal movement of
35 said shaft, a brake-member loosely mounted on said mandrel, a pulley mounted on the mandrel adjacent to said brake-member for rotating said mandrel, and a handle on said shaft adjacent to said brake member,
40 whereby said brake-member may be operated to frictionally engage said pulley for stopping the rotation of said mandrel and shaft coincidently with longitudinal movement of said shaft to release the blank.

45 37. A machine of the class described, comprising a mandrel, a support for said mandrel, means for rotating said mandrel, a shaft mounted in said mandrel while it is held against endwise movement and movable
50 longitudinally thereof, a collet mounted in

one end portion of said mandrel and adjustably connected with said shaft, and a spring for normally holding said collet in operative position.

38. A machine of the class described, comprising a rotary mandrel, a support for said
55 mandrel, means carried by said mandrel for holding a circular blank with end face thereof exposed, a shield extending around said blank-holding means, a lap, a shaft having
60 its axis at right angles to the axis of the mandrel for supporting and rotating said lap, and means for supporting said shaft and moving the same laterally into and out of engagement with the exposed face of the
65 blank.

39. A machine of the class described, comprising a rotary mandrel, a support for said mandrel, means carried by said mandrel for holding a blank with one surface thereof exposed,
70 a shield extending around said blank-holding means, a lap, a shaft having its axis at right angles to the axis of the mandrel for supporting and rotating said lap, and means for supporting said shaft and moving
75 the same laterally toward and from the exposed face of the blank, said shield being slotted to receive said lap-supporting shaft.

40. A machine of the class described, comprising a rotary mandrel, means carried by
80 said mandrel for supporting a blank with one surface thereof exposed, a vertically adjustable support for said mandrel, means for rotating said mandrel, a lap, a rotary shaft for supporting said lap, said shaft having its
85 axis at right angles to the axis of the mandrel, and a support for said shaft movable laterally toward and from the exposed face of the blank.

41. A machine of the class described, comprising a rotary mandrel, a housing in which
90 said mandrel is mounted, means closing the ends of said housing around the mandrel, means carried by said mandrel for supporting a circular blank with end face thereof
95 exposed, and means for supporting and rotating a lap, said lap-holding means being movable toward and from the exposed face of the blank.

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