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Grinding Crystals,

No. 36,548, Patented Sept. 23, 1862.

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IMPROVED MACHINE FOR CUTTING CRYSTALS.

Specification forming part of Letters Patent No. **36,548**, dated September 23, 1862.

To all whom it may concern:

Be it known that I, PAUL PRYIBIL, of the city, county, and State of New York, have invented a new and Improved Machine for Cutting Crystals; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification, in which—

Figure 1 represents a transverse vertical section of this invention, the line *x x*, Fig. 2, indicating the plane of section. Fig. 2 is a longitudinal vertical section of the same, taken in the plane indicated by the line *y y*, Fig. 3. Fig. 3 is a plan or top view of the same.

Similar letters of reference in the three views indicate corresponding parts.

This invention consists, first, in the arrangement of an adjustable inclined revolving shaft carrying a suitable clamp for the crystals, in combination with a grinding-stone revolving on a horizontal shaft in such a manner that by changing the inclination of the clamp-shaft the position of the clamp is adjusted according to the size of the stone and according to the size and shape of the crystal to be cut, and that each stone can be used up down to the very flanges which secure it to the shaft; second, in the arrangement of a gaging-screw in combination with the frame which forms the bearings for the clamp-shaft, and to which a sliding motion can be imparted toward and from the grinding-stone in such a manner that by means of said set screw the clamp can be adjusted to different sizes of crystals; third, in the arrangement of a tipping head provided with two or more set-screws and with a guide-way for the frame of the clamp-shaft in such a manner that by raising or lowering the rear end of said tipping head the clamp is moved toward or from the grinding-stone, and that the crystal can be made to bear on the stone under the most desirable angle; fourth, in the arrangement of two globe-shaped elastic pads, one of which is firmly secured to the upper end of the inclined clamp-shaft, while the second pad is attached to a longitudinally-sliding pivot opposite the first pad, in such a manner that by forcing the second toward the first pad a crystal placed between them is firmly clamped, and at the same time by the peculiar shape of said pads and by their elasticity the danger of breaking the crystal is obviated; fifth, in the employment of a curved flat spring in combination with said elastic pads in such a manner that by the aid of said curved spring the correct position of each crystal between the two pads is determined.

To enable those skilled in the art to make and use my invention, I will proceed to describe its construction and operation with reference to the drawings.

Crystals or glasses for watch-cases have to be cut on their edges, so as to render them perfectly round or circular, and also to chamfer the edge off for the purpose of facilitating its entrance into the grooved ring which forms the lid of the watch-case. This operation of cutting the edges of the crystals is generally performed by hand, each crystal being held against the circumference of a revolving stone and turned until it assumes the desired shape. This operation requires great skill and accuracy, and the most skillful workman is unable to produce crystals with perfectly round edges. It has therefore been proposed to execute this work by the aid of a machine, the principal working parts of which are a series of rotary chucks arranged round a grinding-stone with a conical grinding surface or edge and revolving on a vertical arbor. The chucks consist each of two cups of sheet metal lined with leather or some other suitable material, and corresponding in shape to the shape of the crystals to be cut. These cups rotate in frames which are arranged in an inclined position round the stone, and the crystals are secured between said cups or chucks by means of screws, which serve to force the cups together. A rotary motion is imparted to said chucks by means of pulleys and belts or by gear-wheels, and as the several chucks revolve the crystals fastened between them by coming in contact with the grinding-surface of the revolving stone are cut to the desired shape. The principal disadvantages of this arrangement are, in the first place, the employment of one and the same stone for cutting several crystals simultaneously. This requires a comparatively large stone, and, besides, if the stone wears down an inch or two, it has to be thrown

away, thus considerably increasing the first cost of the machine and rendering a heavy running expense for new stones inevitable. Besides this, the position of the crystals toward the grinding-surface of the stone is such that grooves are cut into the same after a short time, rendering it necessary to turn off the stone at short intervals, at a great loss of time. Furthermore, by having the chucks arranged in a circle it is impossible to place the machine in such a position that all the chucks receive the proper light, except under a skylight, which is only found in a small minority of buildings. All these difficulties are completely obviated in my machine.

The stone A rotates on a horizontal shaft, B, to which a rotary motion is imparted by a belt, *a*, passing over pulleys *b c*, the pulley *c* being secured to the driving-shaft C'.

The crystals to be cut are secured between the globe-shaped elastic pads D D', the pad D being secured to the arbor E, which rotates in the inclined frame F, while the pad D' is attached to a pivot, E', which rotates freely in the upper end of the frame F, and to which a longitudinally-sliding motion is imparted by means of the eccentric lever or knuckle G. A spring, *d*, catching into a groove in the upper end of the pivot E', raises the upper pad, D', whenever the knuckle is turned back. By using the globe-shaped elastic pads crystals of different shape and size can be clamped without danger of breakage, since said pads adapt themselves readily to the varying shape of the crystals, whereas with metallic cup-shaped chucks it is indispensable to have different chucks for different crystals, since, if the concavity of the crystal exceeds that of the chuck, it rests with its center on the lower cup, while the other cup bears on it at a greater or smaller distance from the center, and if the concavity of the chuck exceeds that of the crystal the reverse takes place. The upper cup bears on the center, while the crystal touches the lower cup at a greater or smaller distance from the center. In both cases, when the cups are forced together, the danger of breaking the crystal is imminent.

Another great advantage of my machine over the one previously proposed is derived from the use of the knuckle G. With the old machine a screw is used for forcing the cups together and the slightest carelessness of the operator causes a breakage of the crystal. With the knuckle, on the other hand, the pads are forced together invariably with the same power and to the same distance, and no danger of breaking a crystal by clamping it too hard can possibly arise.

In order to secure the crystals in the proper position between the pads without loss of time, a curved spring, *e*, is secured to the frame F. This spring must be made to suit the size of the crystals, and for different sizes of crystals different springs have to be used. When a crystal is placed between the pads D D', it is pushed up against the inner or concave side of the spring, and the clamp is fastened. As the crystal revolves the spring will give to any inequalities which may occur in the edge of said crystal, so that it does not interfere with the operation of cutting.

The frame F is rigidly secured to a carriage, F', which slides in suitable ways in the head H, a hand-screw, *f*, being provided to impart motion to said carriage. The extent to which the frame F can be moved is determined by the set-screw *g*, which screws into a log, *g'*, rising from the carriage F', and the end of which strikes against a stationary bar, *h*, attached to upper surface of the head H. This set-screw determines the size to which the crystals are cut, and it enables the operator to adjust the frame F readily to crystals of different sizes.

The frame F, together with the head H, are placed in an inclined position toward the grinding-surface of the stone, and this inclination can be changed, as may be desired, by means of set-screws *i j*, which regulate the position of the head H. This head turns on a semi-cylindrical bead near to its inner edge, so that by raising the outer edge the upper part of the frame F, with the clamp D D', is thrown in toward the center of the stone. By these means the frame is adjusted according to the size of the stone and according to the size of the crystals and to the width of the facet or chamfer to be produced. The standard or block H', which supports the head H, is secured to the bed-plate I by means of screw-bolts *i**, which pass through slots *i'**, so that said block, with the head and frame F, can be moved closer to or farther from the grinding-stone; and, when it is desired, the block H' may be so arranged that it can be raised and lowered, which in some cases may facilitate the adjusting of the frame F with the crystal.

A slow rotary motion is imparted to the clamp-arbor E by an endless screw, J, which is attached to a shaft, K, that has its bearing in a box, L, supported by a standard, M. Said standard is secured to the bed-plate in such a manner that it can be moved toward or from the arbor E, and the box L, which forms the bearing of the screw-shaft K, is secured to the standard by means of a screw-bolt, *j*, which allows of adjusting said shaft in a horizontal or in an inclined position, as may be desired. The screw J gears into a worm-wheel, N, that is firmly secured to the arbor E, and this worm-wheel N is made conical, as clearly shown in Fig. 1 of the drawings, so that the same remains correctly in gear with the worm-wheel even if the inclination of the arbor E is changed. The manner in which the shaft K is hung also serves to enable the operator to change the position of the screw J according to the varying position of the clamp-arbor.

The employment of the endless screw and worm-wheel is desirable, because by these means a steady continuous strain is exerted on the arbor E, and that peculiar trembling or quivering motion which the crystal is lia-

ble to assume when the arbor is driven by ordinary cog-wheels or by belts and pulleys is avoided.

It is obvious that a series of grinding-stones may be applied to the same shaft, each stone being provided with its own clamp, so that one person is enabled to attend to four or more stones simultaneously.

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

1. The arrangement of the adjustable inclined revolving shaft E, carrying the clamp D D′, in combination with the stone A, rotating on a horizontal shaft, B, constructed and operating in the manner and for the purpose specified.

2. The arrangement of the gaging-screw *g*, in combination with the frame F and with the adjusting-screw *f*, as and for the purpose described.

3. The arrangement of the tipping head H, with two or more set-screws, *y*, in combination with the sliding carriage F′, attached to the frame F, the whole constructed and operating as and for the purpose set forth.

4. The arrangement of two globe-shaped elastic pads, D D′, in combination with the rotary shaft E and pivot E′, constructed and operating in the manner and for the purpose shown and described.

5. The employment of the curved spring *e*, in combination with the elastic pads D D′, substantially as and for the purpose specified.

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