No. 886,310. PATENTED APR. 28, 1908.

J. WENNSTROM.

JEWEL CUPPING MACHINE.

APPLICATION FILED MAR. 29, 1906.

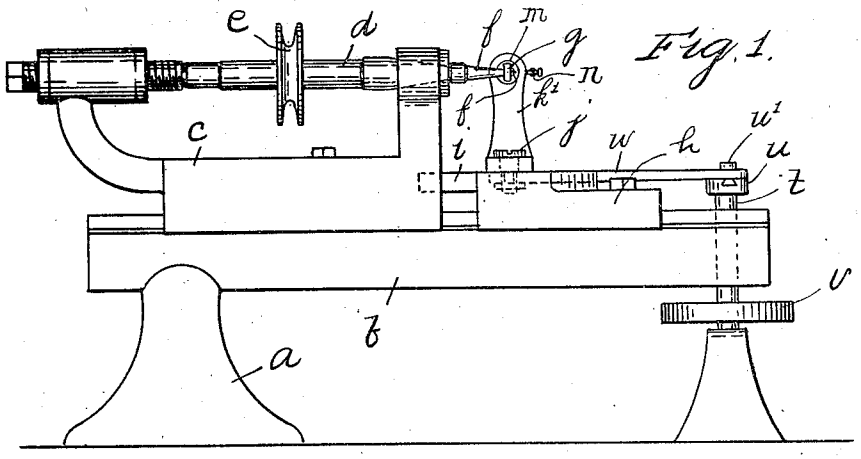


Fig. 1.

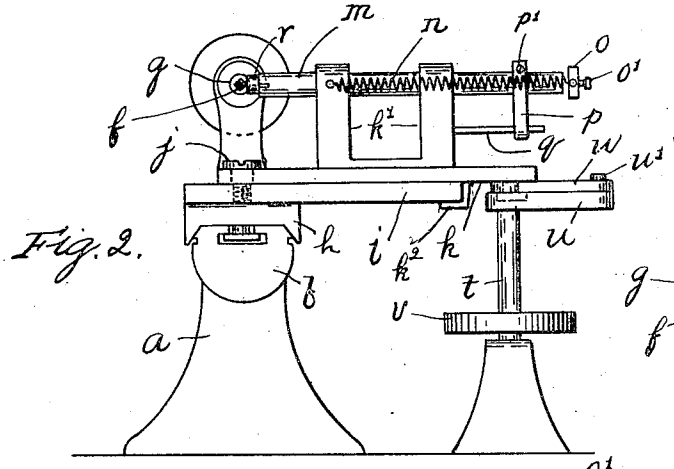


Fig. 2.

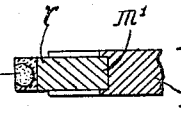


Fig. 4.

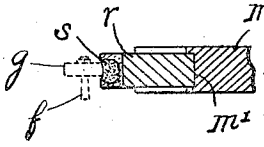


Fig. 5.

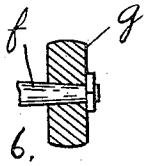


Fig. 6.

Fig. 3.

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UNITED STATES PATENT OFFICE.

JOHN WENNSTROM, OF BROOKLYN, NEW YORK, ASSIGNOR TO THE AMERICAN CUPPED DIAMOND CO., A CORPORATION OF MAINE.

JEWEL-CUPPING MACHINE.

No. 886,310. Specification of Letters Patent. Patented April 28, 1908.

Application filed March 29, 1906. Serial No. 308,699.

To all whom it may concern:

Be it known that I, JOHN WENNSTROM, of Brooklyn, county of Kings, State of New York, have invented an Improvement in Jewel-Cupping Machines, of which the following description, in connection with the accompanying drawings, is a specification, like characters on the drawings representing like parts.

This invention relates to a machine which is adapted to form a cup or recess in an extremely hard substance, particularly a diamond, so that it may be used as a step bearing for electric meters and similar purposes.

A diamond has a sort of "grain", as does wood, and the direction in which this grain runs must be taken into consideration in grinding or cutting a diamond, if this work is to be done to the best advantage. In other words a diamond can be cut only with the greatest difficulty, if at all, when the grinding surface moves over the diamond in some directions, while it may be cut with comparative ease if the grinding surface moves over the diamond in a particular direction. In forming a cavity in a diamond which would render the same suitable for a step bearing, it is essential that the surface of the cavity or cup be perfectly smooth and rounded, in order that friction may be minimized.

My invention has for its object to provide a form of grinding machine which is especially adapted to form, in a diamond or other hard jewel, a spherical-shaped cavity or cup, the surface of which shall be perfectly smooth.

A further object is to provide a machine of this character which is adapted to enable the operator to cause the grinding device to operate upon the work to the best advantage, and with facility.

I accomplish these, and other advantageous results, by the means shown in the accompanying drawing, in which,

Figure 1 is a side elevation of a grinding machine provided with my invention. Fig. 2 is an end view, and Fig. 3 is a plan view thereof. Figs. 4 and 5 are detail, longitudinal sectional views of the chuck, showing the work in semifinished and finished condition respectively, and Fig. 6 is a detail sectional view of the grinding head.

The grinding machine comprises a base *a* having a bed *b* on which is mounted a head stock *c*, in which a horizontal shaft *d* is journaled, said shaft being provided with a pulley *e* by means of which it may be driven. A spindle *f* is removably secured to the front end of the shaft *d*, and a grinding head *g* is mounted in said spindle. Said grinding head *g* is preferably disk-shaped having its edge rounded or curved transversely about the central point in the disk:—that is, the head is substantially represented by the zone of a sphere, the central plane of which intersects the center of the sphere. This head is preferably made of soft cast iron, for reasons which will hereafter appear. A tail stock *h* is also mounted on the bed *b* and a flat, rearwardly and horizontally projecting table *i* is rigidly secured to said tail stock.

A holder *k* rests on and is pivotally mounted by means of a bolt *j* on the flat horizontal surface of the table *i*, said bolt *j* being so located that the said holder swings about a vertical axis, a continuation of which intersects the center of the head *g*, and therefore the axis of the shaft *d* at right angles. A chuck, which comprises a straight rod *m* having a centrally disposed work-receiving recess or cavity *m'* in one end, is mounted to slide longitudinally and horizontally in two uprights *k'*, integral with holder *k*, in such a position that the longitudinal center line of said rod intersects the center of the grinding head *g*, and consequently the point of intersection of the axes of shaft *d* and of holder *k*. Springs *n* are each connected at one end to an upright *k'*, and at their other ends to a bar *o*, which is adapted to engage the rear end of the chuck rod *m* to press the same towards the grinding head. An adjusting screw *o'* is preferably provided in the bar *o*, which is adapted directly to engage the end of rod *m*, so that by turning this screw the tension of the springs may be varied, and consequently the force with which the chuck is forced towards the head *g* will be correspondingly varied. An arm *p* is adjustably connected to rod *m* by means of a set screw *p'*, and a fixed guide rod *q* is mounted on the rear standard *k'* and passes through the arm *p*, so that said rod *m* is held from turning while being free to reciprocate as above described.

In preparing the stone for cupping it is customary to set the same on the end of a steel billet, or wire, as *r*, by brazing or by other means, so that the jewel will be held

thereon with the greatest rigidity. See Figs. 4 and 5. As the rough diamond thus secured to the steel billet is very irregular, it is necessary that a face be provided thereon, which is at right angles to the billet in which the cup is to be formed, as shown in Fig. 4. This face is readily formed by pressing the end of the billet against a flat polishing wheel. In performing this operation the billet is turned until the position is found in which the diamond may be ground to the best advantage. That is, the direction of the grain of the diamond is ascertained and then the end of the billet is marked accordingly. These billets *r* are cut off in short lengths, and are adapted to fit tightly in recess *m'* of the chuck *m*.

A vertical shaft *t* is suitably mounted in the rear of the bed *b*, said shaft having a crank-arm *u* and a driving pulley *v* mounted thereon. A connecting rod or link *w* is pivotally connected at one end to the holder *k*, and at its other end to the crank arm *u* by means of a crank pin *u'*, said crank-pin being adjustable in a dove-tail slot u^2 formed in and extending longitudinally of the crank-arm throughout its entire length. It will be apparent that when the shaft *t* is rotated the holder *k* will be oscillated, the amplitude of its oscillations obviously depending on the position to which the crank-pin *u'* is adjusted with reference to the axis of shaft *t*.

To set the diamond holding billet *r* in the chuck, it is usually more convenient to remove the rod *m* from its support, this being done by simply lifting the bar *o* out of engagement therewith and drawing it out of the supporting uprights *k'*. The billet is then tightly set in such a position in the chuck that the grinding head will act on the diamond the correct way of the grain, or to the best advantage, when the chuck has been replaced. The chuck rod *m* having been placed in position in the uprights *k'*, and the springs *n* and bar *o* having been readjusted, the diamond *s* will be pressed against the grinding head *g*, and the shafts *d* and *t* will be rotated, causing the head *g* to be rotated and the chuck *m* to be oscillated about the pivot bolt *j*, the portion of the face of the diamond which engages the head *g* thus being moved in an arc having as its center the center of the curved face of the head. This face of the head *g* is supplied with a mixture of oil and diamond dust, and the latter becomes embedded in the pores of the cast-iron of which said head is composed, so that the diamond dust acts to grind the diamond and form a cup or cavity therein. The cup thus formed, however, would be rough or have grooves or scratches running across it in the direction of the path of rotation of the head *g* if the diamond were held stationary, but, as the latter is oscillated transversely of said path while the grinding operation is taking place, the whole surface engaged is ground evenly, so that the surface of the spherical shaped cavity or cup which is formed in the diamond is perfectly smooth and highly polished.

I have found that with different diamonds the amplitude of the oscillations may be varied to advantage, although I prefer to have the oscillations of sufficient length to cause the diamond to engage the face of head *g* throughout its entire width, so that an annular groove will not be formed in said face of the head, but said face will always be kept in the form of a sphere or zone.

While the direction of the grain of the stone will ordinarily be found in facing it, so that when it is first placed in the machine it will be ground to the best advantage by the head *g*, yet if it is found on examination, after the grinding operation has been carried on for a suitable length of time, that the grinding head is not acting on the diamond to the best advantage, the screw *p'* may be loosened and the chuck or rod may be turned to a different position. Then the screw *p'* is tightened and the grinding operation is resumed, further adjustments obviously being made if necessary. I have found that the force with which the diamond is forced against the head *m* may often be varied to advantage, as some diamonds can be ground fastest under a light tension and others fastest under a heavier tension. For this reason I provide the adjusting screw *o'* in the bar *o*, so that this force may be quickly varied.

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

1. In a grinding machine, a rotatable grinding head, a work holder, a rod rotatably mounted in said holder and longitudinally movable therein to and from said head, said rod having a chuck in its end next the head, and means for locking said rod in different positions of rotation, said means permitting said longitudinal movement of said rod, substantially as described.

2. In a grinding machine, a rotatable grinding head, a chuck mounted to rotate about and move longitudinally of an axis which intersects the axis of said head at an angle, and means for locking said chuck in different positions of rotation which permit said longitudinal movement thereof, substantially as described.

3. In a grinding machine, a rotatable grinding head, a chuck holder, a rod having a chuck in one end and mounted to rotate, and to move longitudinally in said holder towards said head, an arm rotatably connected to said rod and extending transversely thereof, means for locking said arm on said rod, and means engaging said arm for holding it from swinging movement about said

rod and permitting longitudinal movement of the rod while the arm is locked thereon, substantially as described.

4. In a cup-grinding machine, a rotatable, curved-faced grinding head, a bed, a chuck-holder pivoted thereon and movable about an axis which intersects the center of said head, a chuck mounted on said holder, and movable in a line intersecting said center, means for automatically oscillating said holder about its said axis, said bed having a flat bearing surface extending transversely of said holder's axis for supporting said holder in the different oscillatory positions thereof, substantially as described.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

JOHN WENNSTROM.

Witnesses:
L. H. HARRIMAN,
H. B. DAVIS.