L. POPPE.

APPARATUS FOR REGRINDING AND POLISHING PERFORATED DIAMONDS.

APPLICATION FILED MAY 14, 1910.

983,929.

Patented Feb. 14, 1911.

2 SHEETS—SHEET 1.

Fig. 1.

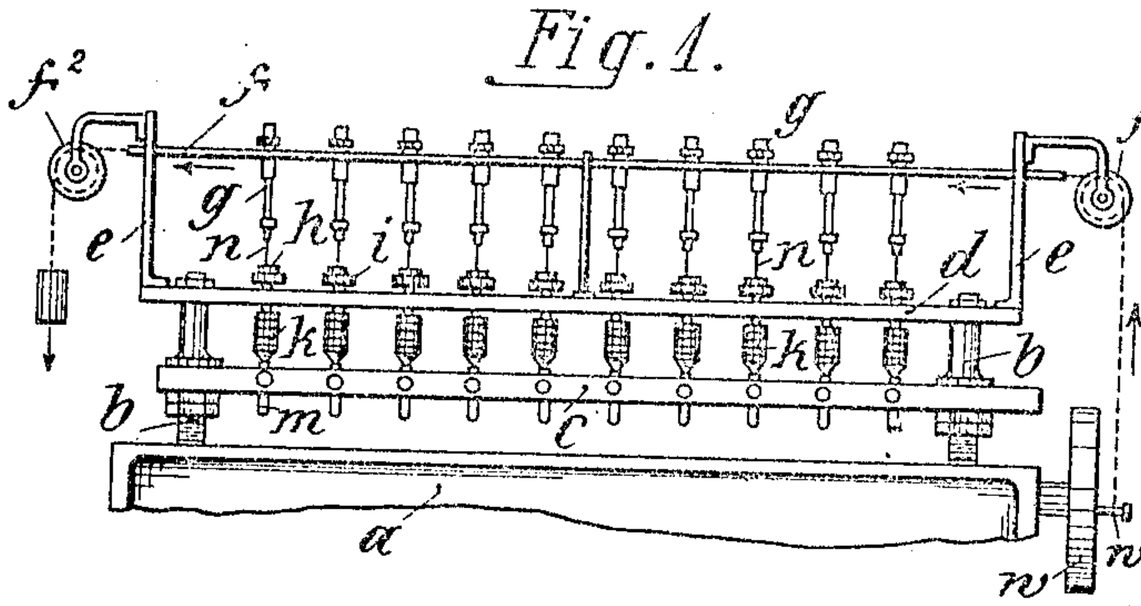


Fig. 2.

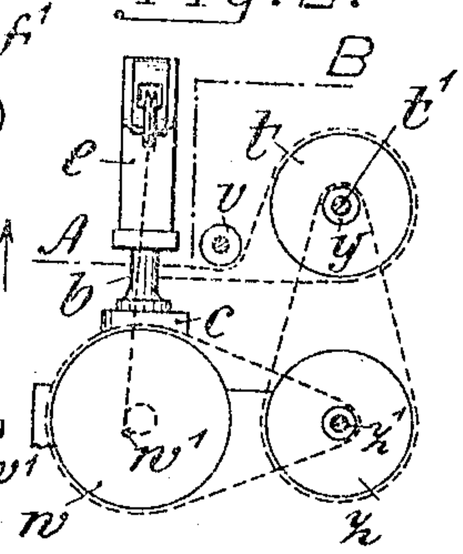


Fig. 3.

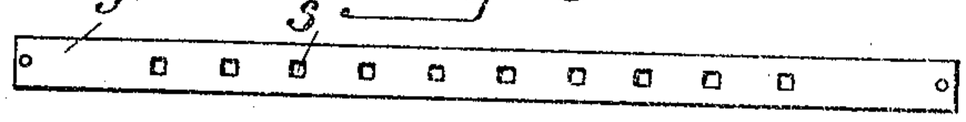


Fig. 4.

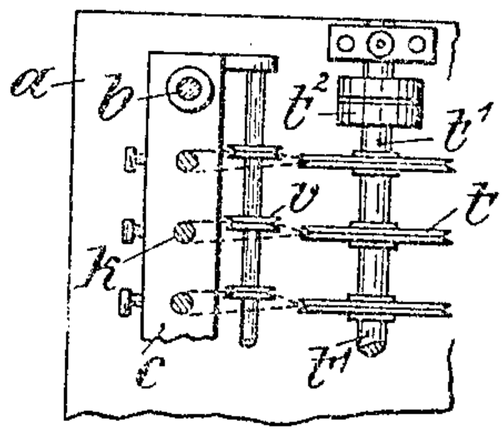


Fig. 5.

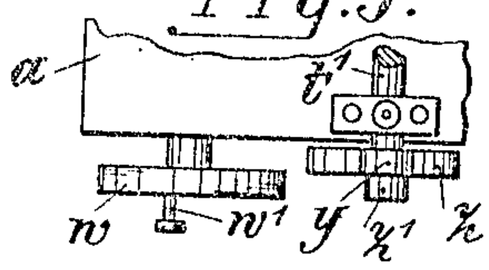


Fig. 7.

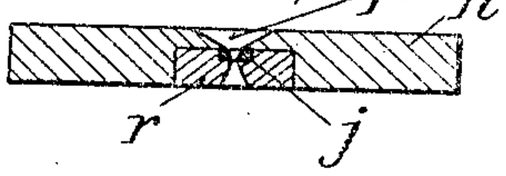


Fig. 9.

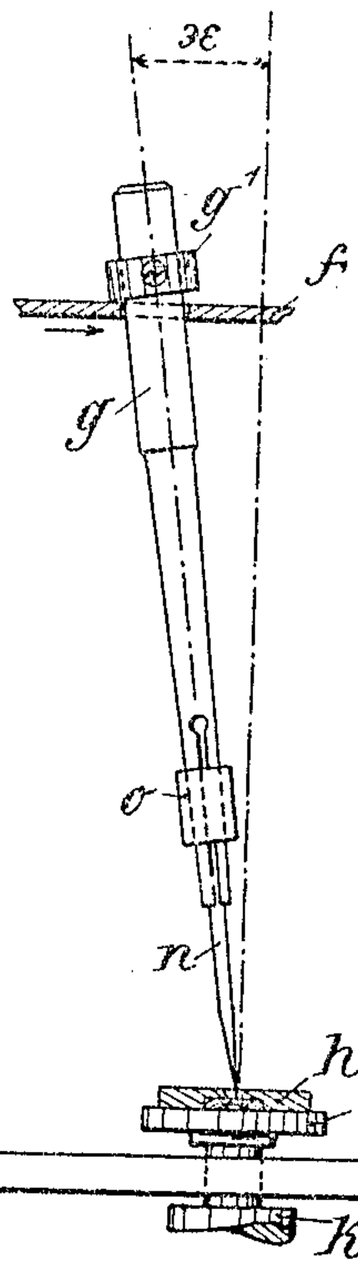


Fig. 8.

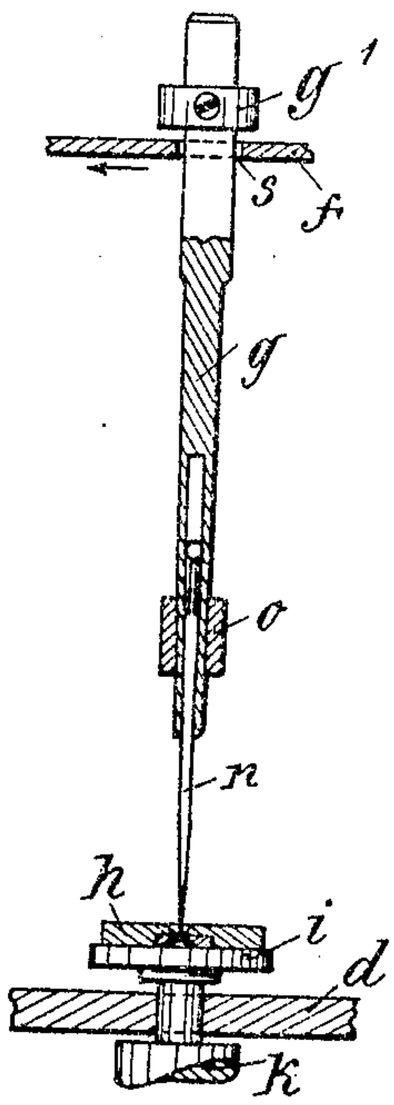
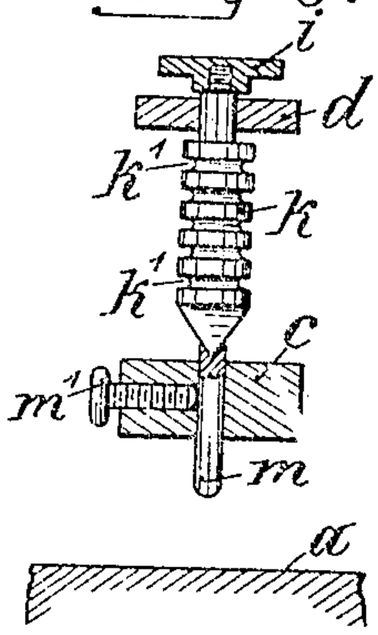


Fig. 6.



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APPLICATION FILED MAY 14, 1910.

983,929. Patented Feb. 14, 1911.

2 SHEETS—SHEET 2.

Fig. 10.

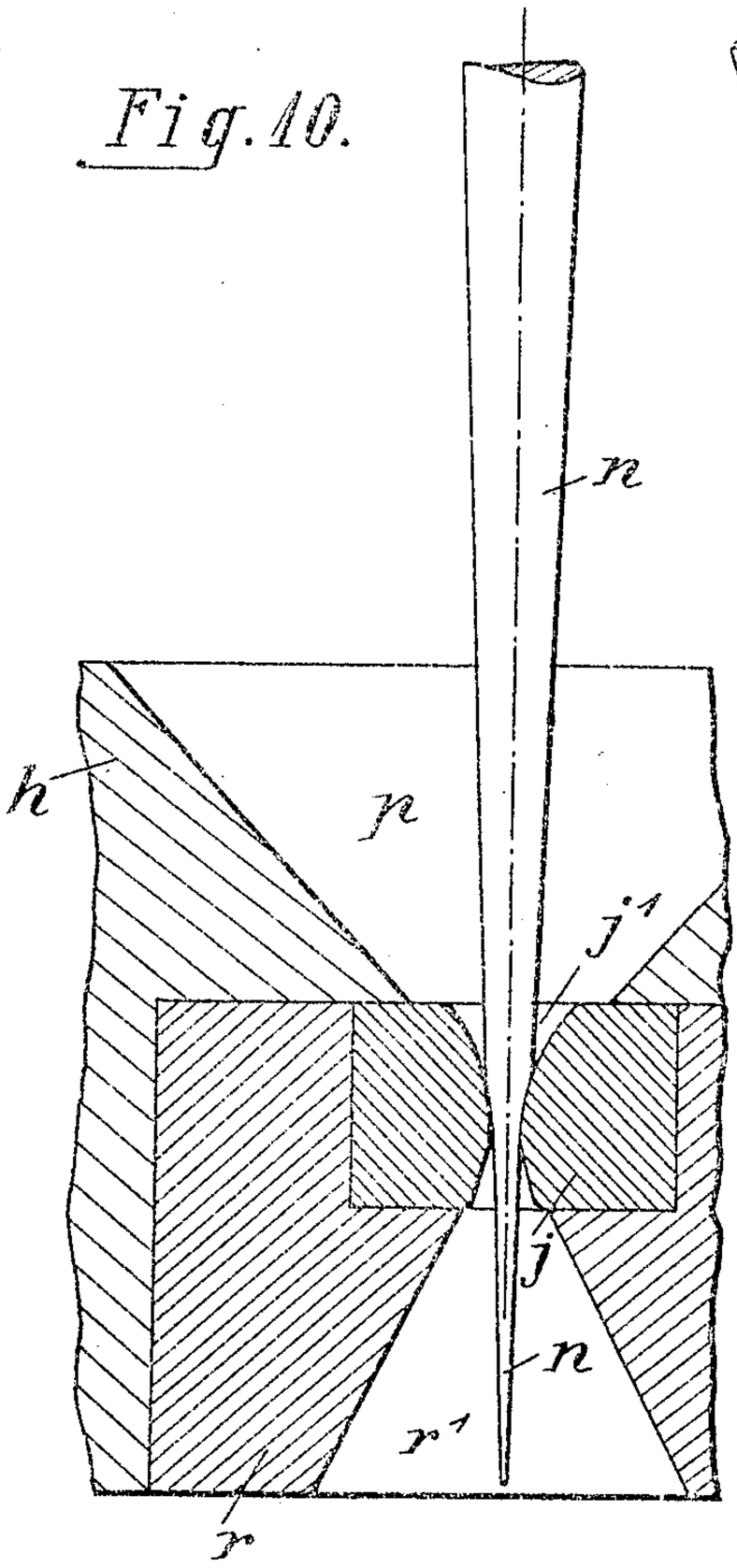


Fig. 11.

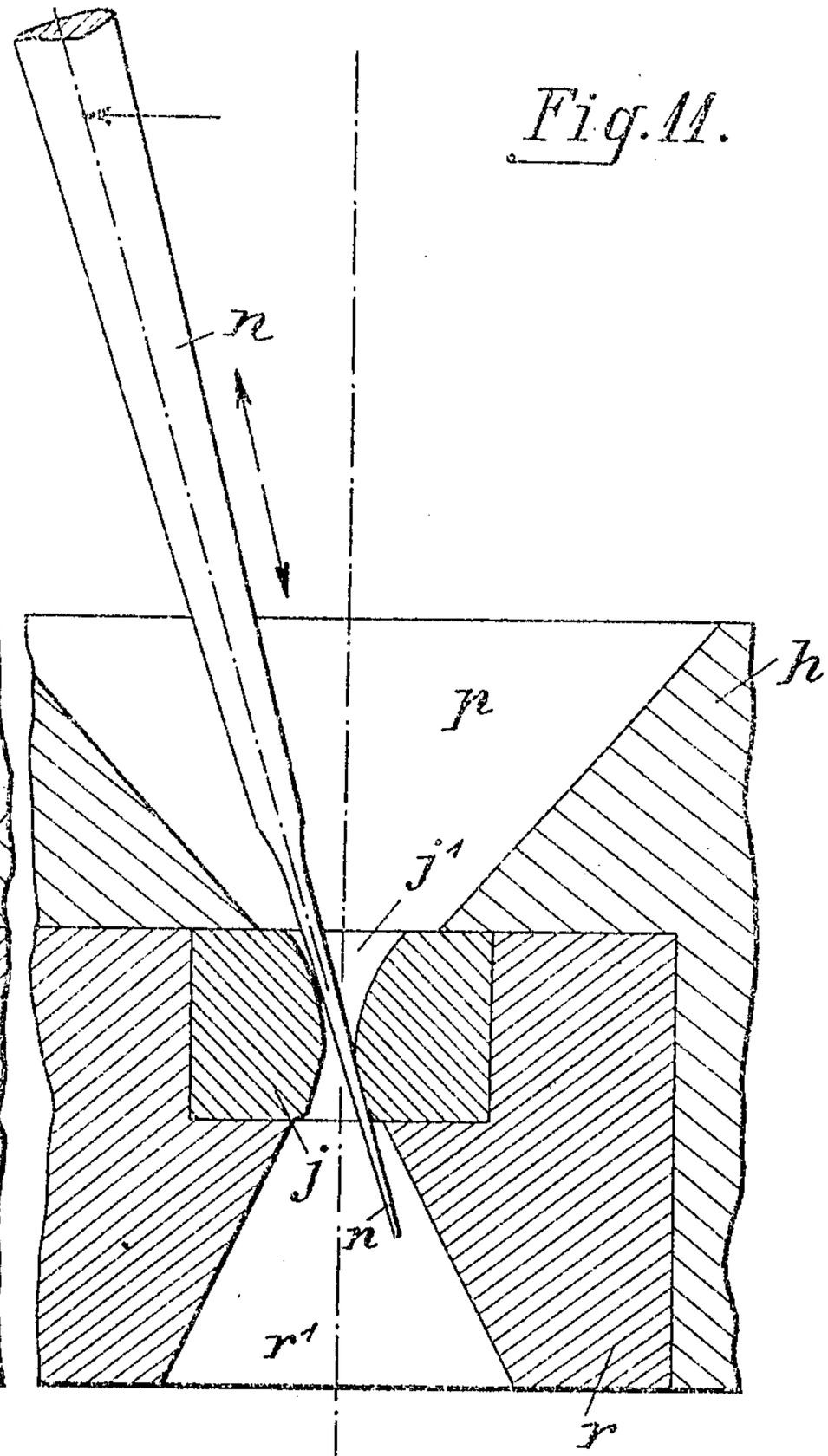
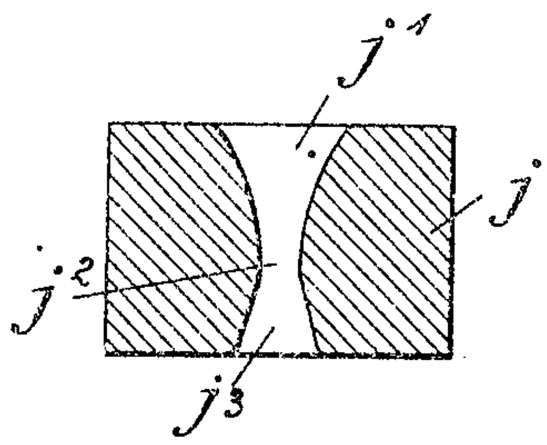


Fig. 12.



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APPARATUS FOR REGRINDING AND POLISHING PERFORATED DIAMONDS.

983,929. Specification of Letters Patent. **Patented Feb. 14, 1911.**

Application filed May 14, 1910. Serial No. 561,336.

To all whom it may concern:

Be it known that I, LEOPOLD POPPE, a subject of the King of Saxony, and residing at Berlin, Germany, have invented certain new and useful Improvements in Apparatus for Regrinding and Polishing Perforated Diamonds, of which the following is a specification.

My invention relates to improvements in machines for grinding and polishing in stones, such as are employed in the wire industry for all ductile metals from about 2 mm diameter downward and provided with a slender pointed steel needle oscillating and locating with its point in the hole in the stone which rotates round a vertical axis; and the objects of my improvement are, first, to afford facilities for obtaining the desired form of the wall of the stone; second, to avoid and remove cracks and sharp edges on the stones; third, to reduce the power which has the tendency to bend the needle and to loose or to break off the rotating stone.

In order that my invention may be clearly understood reference will be made to the accompanying drawing, wherein:—

Figures 1 and 2 are front and end elevations, respectively, of one form of my apparatus; Fig. 3 is a top plan view of the rod or rail which loosely holds and moves the shafts of the tools; Figs. 4 and 5 are plan views, partly shown in horizontal section on the line A—B in Fig. 2, showing various parts of the apparatus; Fig. 6 is an elevation of a spindle which is adjustable in height in the machine frame and serves simultaneously as a grooved or step pulley for the rotating work-table; Fig. 7 is a longitudinal section through a piece of work or carrier having a diamond secured therein; Figs. 8 and 9 are elevations, on an enlarged scale, showing the tool resting vertically and slantingly, respectively, without positive guidance in the diamond; Figs. 10, 11 and 12 illustrate the operation of the tool in the diamond and the final shape of the bore or hole on a scale about twenty times the natural size.

Referring firstly to Fig. 1, two rails or bars *c*, *d* are held by means of columns *b* on a machine bed *a* at a suitable distance apart and from the table, the bottom rail *c* being mounted in such manner that it can be lowered, after the nuts holding it have been loosened for example.

As shown in Figs. 1 and 6, in the bottom rail *c* an optional number of bearings *m*, *e. g.* 10, are so arranged that they can be adjusted in height and fixed by means of screws m^1. In each adjustable bearing *m* rests the point of a spindle *k* which is provided with grooves k^1, if necessary of various sizes, as a grooved or step pulley, is journaled above in the rail *d* and carries thereabove a detachable table *i*. Two arms *e* on the one rail, *e. g.* the rail *d*, serve for guiding a rail or bar *f* which is provided with holes *s* (Fig. 3) and can move readily horizontally to and fro on these arms.

The tool is a needle *n* (Figs. 1, 8 and 9) which is provided with a specially shaped point and preferably held in a hollow, slotted holder *g* by means of clamping ring or slide *o*, as shown in Figs. 8 and 9. The top ends of the holders *g* are inserted into the holes *s* in the rail *f*. On the table *i* of each spindle rests a plate *h* in whose center the piece of work or diamond is secured. Above the rail a driving ring g^1 is adjustably secured on each holder.

The rail *f* can be driven and the spindles, step pulleys or grooved pulleys k^1 provided with the tables *i* can be rotated in optional manner. One form of driving device is represented by way of example in Figs. 1, 2, 4 and 5. Behind the spindles *k* is journaled a shaft t^1 provided with a loose and a fast driving pulley t^2, and on the shaft t^1 is keyed for each of the spindles *k* a grooved pulley *t* (Fig. 4), from which the one end of the cord is led directly to the spindle *k* and the other is conducted out of the plane of the groove by means of an idler *v* as shown in Figs. 2 and 4. At one end of the machine, *e. g.* the right-hand, there is keyed on the shaft t^1 a pulley *y* whose motion is imparted *e. g.* by means of a cord to another pulley *z*, on whose shaft is secured another pulley z^1 for driving a pulley *w*. This pulley *w* is provided with a crank w^1, from which a cord passes over a roller f^1 to the rail *f*. Attached to the other end of the rail *f* is a cord running over a roller f^2 and carrying a weight f^3. In this illustrative embodiment all the spindles *k* and their tables *i* are rotated rapidly simultaneously and the rail *f* is reciprocated horizontally and imparts an oscillatory motion to the holders *g* carrying the tools *n*. The stroke of the rail *f* corresponds approximately to the angle *x* shown by dotted lines in Fig. 9.

If preferred, the stroke of rail *f* can be made variable by making the crank w^1 (Figs. 1 and 2) adjustable radially.

As mentioned above, the perforated diamond *j* is secured in a plate *h* (Fig. 7), namely by means of a lead plug *r*. The plate *h* has a conical or funnel-shaped cavity *p* leading to the diamond *j* and is mounted centrally to the axis of rotation on the table *i* by means of wax, as shown in Figs. 7, 8 and 9, and the point of each needle *n* is inserted into the hole of a diamond, a well-known polishing medium, in general a mixture of diamond dust and oil, being previously applied to the point of the needle. While the diamond is rapidly rotating the top part of the needle oscillates and its slanting position corresponds to the desired conicity of the hole in the diamond. But as the driving ring g^1 of the shaft *g* rests on the rail *f* at a certain, previously-determinable slanting position (Fig. 9), thus before the stroke of the rail corresponding to the distance *x* is finished toward the left-hand or right-hand side, when the needle is in its extreme slanting position it is raised in the hole in the diamond and, when rocking back into the perpendicular position, is released again for falling unimpededly, so that it constantly rests on the wall of the hole, grinds the hole round in the vertical position and always provides for distributing the polishing medium.

As has been frequently emphasized hereinbefore and will be readily understood, the tool, *i. e.* the needle *n*, is not guided positively until it is being withdrawn from the hole, so that even when the diamond is not secured exactly centrically the desired action nevertheless takes place and it is impossible for the mount *h* of the stone to be forced off the table *i*.

When it is required that the needle *n* shall oscillate only toward one side, say the angle *x* as indicated in Figs. 9 and 11, the needle is raised from a certain moment onward and lies loosely on the walls of the hole so that the three zones j^1, j^2, j^3 (Fig. 12) of the hole are worked correspondingly to the purpose in view. Owing to the needle lying loosely against, and to its being drawn over, the walls of the hole not only is the desired, slightly curved form of the wall obtained, but also cracks and sharp edges are avoided and removed. Such an action was impossible with the devices known heretofore because the working part was guided positively in the same, so that the tool could only exceptionally and for a short time lie against the walls of the hole, particularly in the vertical position of the needle, in which irregular holes beginning from the smallest diameter are principally ground round.

I claim:—

In apparatus for regrinding and polishing holes in diamonds, the combination, with a revoluble table carrying a drilled diamond, of a perforated horizontal rail mounted to reciprocate horizontally above the table, a holder freely movable in a hole in said rail and carrying a needle resting in the hole in the diamond, a driving ring secured adjustably on said holder above said rail, and means for rotating said table and simultaneously reciprocating said rail, the position of said ring on said holder relatively to said rail being such that, when the holder is vertical, the ring is raised above the rail but, when the holder is being oscillated into its extreme slanting position, the ring rests on and is driven positively by the rail before the holder arrives into its extreme slanting position.

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