L. POPPE.

PROCESS OF REGRINDING AND POLISHING PERFORATED DIAMONDS.

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1,039,186. Patented Sept. 24, 1912.

Fig. 1.

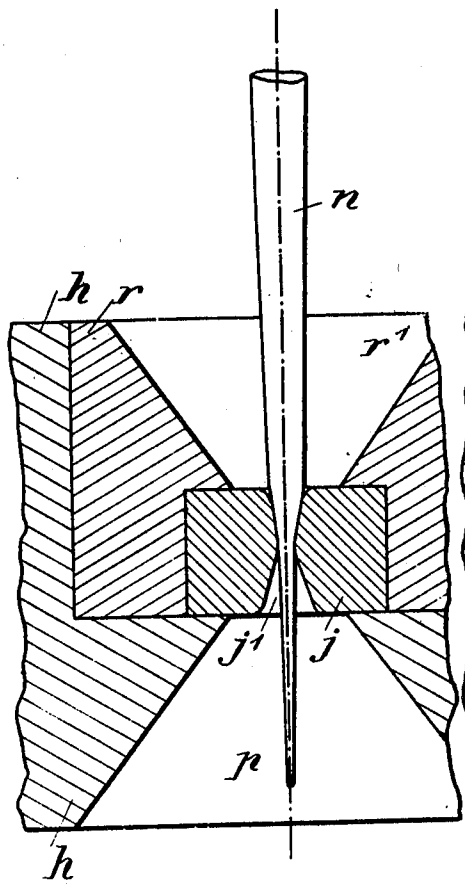


Fig. 2.

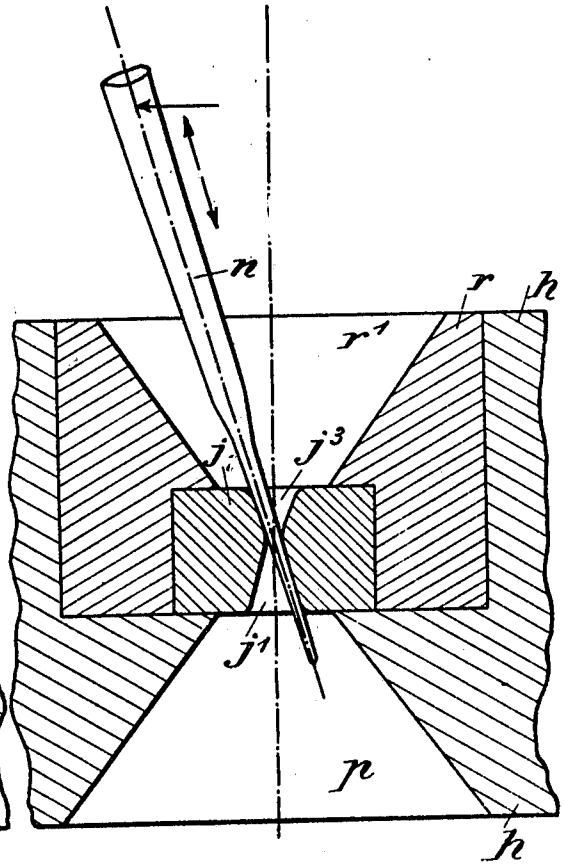
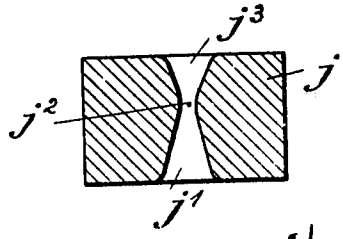


Fig. 3.



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PROCESS OF REGRINDING AND POLISHING PERFORATED DIAMONDS.

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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 Processes of Regrinding and Polishing Perforated Diamonds, of which the following is a specification.

The subject-matter of my invention is a process for regrinding and polishing perforated diamonds, so-called draw stones, such as are employed in the wire industry for all ductile metals from about 2 mm. diameter downward. It is well-known that these diamonds wear rough and untrue or irregular and that therefore the holes frequently have to be reground and polished in order to render them usable again. In the simplest known machines employed for this purpose a slender, pointed, steel needle is rapidly pushed to and fro in the hole in the rotating stone, on which needle the grinding and polishing medium is applied. By placing the needle slantwise to the axis of the stone a conical shape of the hole similar to that required can be obtained, but it is found that when grinding in this manner the correct shape of the hole is entirely destroyed because, according to the adjustment of the needle in each instance, only one small zone of one side or the bore is ground. In order to improve this result, special positive motion relatively to the axis of the hole was imparted to the grinding needle by more or less complicated mechanism; but this also did not lead to the end in view, to maintain the original conicity of the bore when polishing; this was due to the guidance and rotation of the polishing-needle holder being bound to one definite fixed point outside the bore in the stone, and the lateral motion being positive, *e. g.* derived from a cam. The shape of the holes is, however, generally always different; sometimes the bore is long, sometimes it is short, and the position of the bore is itself also very different in consequence of unequal sizes of the mounts of the stones. In addition, the needle can frequently not swing sufficiently out of its middle position, because otherwise when reciprocating in the bore it bends or jams or forces away the stone which is only cemented onto the table or disk by means of wax. In consequence of these defects polishing machines of this kind have in fact, so far as I am aware, nowhere been used permanently and with the desired result. Further, it has been attempted conically to regrind the holes in the stones by utilizing, instead of the polishing-needles known heretofore, a wire which is pulled taut through the bore and is reciprocated during the grinding operation in the bore of the stone which is rotated and simultaneously oscillated about its vertical axis. It may be left uncertain whether fine holes can be ground profitably by employing very firm kinds of such fine grinding-wires of *e. g.* 0.1 mm. diameter down to the finest holes, say to 0.015 mm. diameter, for it is clear that the fine grinding-wire, which has to stand a certain tension, will very rapidly rupture in consequence of the sharp diamond dust; also, on account of its too little strength it cannot be tensioned so tightly that untrue or irregular holes are reground round, which is very important, and consequently an irregular hole would be ground round with difficulty though it might be ground larger. Lastly, the consumption of expensive diamond-dust is incomparably greater for a definite output when fresh grinding-wires are constantly employed as compared with when only one and the same needle point does the grinding.

Now a primary object of my invention is to provide an improved polishing process in which all these defects and the drawbacks attaching to polishing devices used heretofore are not present.

My improved process substantially consists in locating the grinding tool—the approved slender and conical pointed steel needle—with its point in the hole in the stone until it rests freely with its own weight on the walls thereof, in rotating the diamond as usually in other grinding processes, around a vertical axis, in oscillating

the needle in a manner known *per se* slowly and uniformly around its perpendicular position or around the axis of rotation of the stone to a definite slanting position toward both sides or only toward one side, and according to my invention, in simultaneously gradually withdrawing the needle, while it is moving toward the extreme slanting positions, from the hole beginning at a determinable slanting position; when the needle oscillates back it slides again into the hole solely under the action of its own weight, without the employment of positive guidance, namely always so far that, when passing its middle position, the needle rests freely and unimpededly on the wall of the hole in the stone. In this manner I obtain that, in the vertical position of the needle, its point—which moreover can be ground exactly corresponding to the shape of the hole at the beginning of the grinding operation—contacts with the bore or hole at its narrow parts in so far as it is untrue or irregular, which is an absolute necessity in order to make irregular holes round again.

Owing to the oscillation of the needle and the simultaneous withdrawal of the needle point from the hole I obtain the advantage, apart from a slanting position of the needle corresponding to the conicity of the hole, that the needle point is not bent so sharply that it loosens or breaks off the rotating stone, which is only secured by means of wax, but nevertheless bends at the inlet side in the cone so that the cone is made somewhat curved.

The novelty and essential features of my process are, particularly, that the grinding-needle rests, in all the phases of the grinding operation, with its weight on the walls of the hole in the stone so long as it is not removed therefrom, so that even untrue or irregular holes must be ground round, and that simultaneously, when the needle passes along the wall of the hole, *i. e.* when the needle rises and falls, the polishing medium is constantly supplied to the part being ground, which enables the most economical use of the expensive diamond-dust; the correct shape of the hole—gradually tapering with slightly curved walls on the one side, and optional, small enlargement of the outlet at the other side—is obtained without special adjustment of the apparatus solely by the peculiar behavior of the polishing-needle in the hole, so that the stones worked in this manner are distinguished particularly by great durability and soft and smooth drawing. My new process has, however, other additional small advantages which are entirely lacking in processes known heretofore. Namely, owing to the free guidance of the needle its wear is diminished; one needle can be put into and out of operation in a hole without stopping the machine and disturbing the operation of other needles.

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

Figures 1, 2 and 3 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 to Figs. 1 and 2, the perforated diamond j is secured in a rotatable plate h namely by means of a lead plug r. The plate h has a conical or funnel-shaped cavity p. The point of the 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. 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 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 bearing the plate h.

When it is desired that the needle n shall oscillate only toward one side, say the angle x as indicated in Fig. 2 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. 3) 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 processes known heretofore because the working part was guided positively, 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:—

A process for grinding jewels having through bores, which consists in rotating the jewel, in projecting a needle into and

through the bore, in oscillating the needle away from and into coincident relation with the axis of said bore, a slightly lifting the needle during that period of its swing or oscillating movement away from such axis, and in disposing the weight of the needle on the walls of the bore during its swing from an outward position toward said axis, substantially as described.

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