A. DANIELSSON.

MACHINE FOR GRINDING CONCAVE SPHERICAL SURFACES.

APPLICATION FILED OCT. 7, 1919.

1,352,790.

Patented Sept. 14, 1920.

2 SHEETS—SHEET 1.

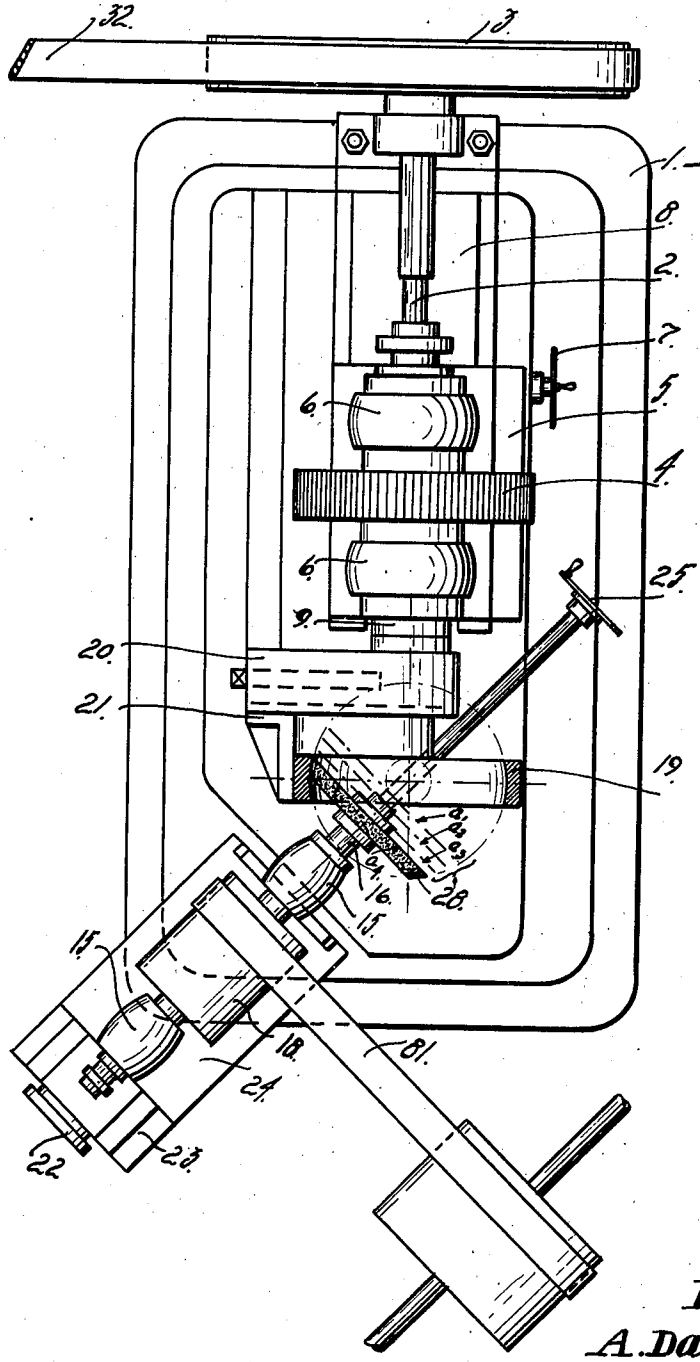


Fig 1.

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2 SHEETS—SHEET 2.

Fig. 3.

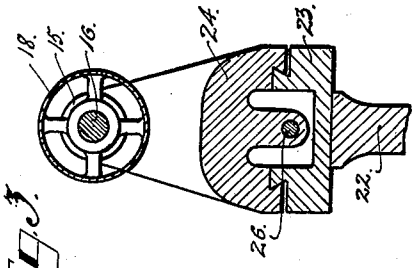
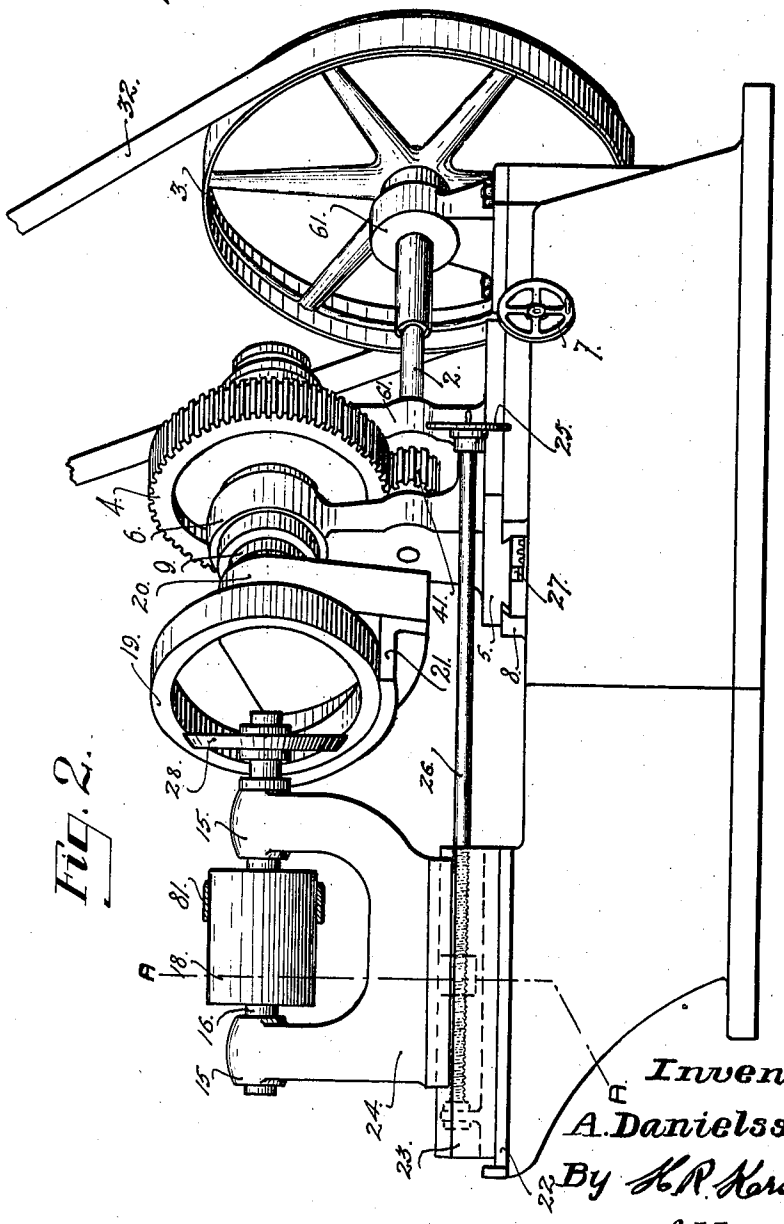


Fig. 2.



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UNITED STATES PATENT OFFICE.

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MACHINE FOR GRINDING CONCAVE SPHERICAL SURFACES.

1,352,790. Specification of Letters Patent. Patented Sept. 14, 1920.

Application filed October 7, 1919. Serial No. 329,178.

To all whom it may concern:

Be it known that I, AXEL DANIELSSON, a subject of the King of Sweden, residing at Gottenborg, Kingdom of Sweden, have invented certain new and useful Improvements in Machines for Grinding Concaved Spherical Surfaces, of which the following is a specification.

The present invention relates to a proceeding for grinding concave spherical surfaces as well as to a device for carrying out this proceeding.

The object of the invention is a proceeding by means of which cavities are made exactly spherical. The invention has also for its object to provide simple means for carrying out the proceeding.

To this and other ends the invention consists in certain improvements, which hereinafter will be fully described and ascertained in the annexed drawing.

In the accompanying drawing there is shown in Figure 1 a plan view of a grinding machine for carrying out the proceeding; in Fig. 2 a side elevation of the same machine and in Fig. 3 a section on the line A—A in Fig. 2.

Referring now to the drawing 19 indicates a sleeve-shaped work-piece, fixed to a shaft 9 by means of a holder 21 on a face plate 20, which shaft also is provided with a gear-wheel 4. The holder for the sleeve-shaped work-piece is so designed, that a free space is left between the said work-piece in the opposite face plate 20, thus permitting the grinding wheel 28 to project through the open ends or the apertures on both sides of the sleeve-shaped work-piece, as shown by dot and dash lines in Fig. 1. The shaft 9 is journaled in two bearings 6, fixed on a table 5, which by means of a hand-wheel 7 operating a toothed bar 27 on the under side of the table can be slid in a guide 8. The gear-wheel 4 on the shaft 9 meshes with the shaft 2 by means of a gear-wheel 41 on said last mentioned shaft. The shaft 2 is journaled in two bearings 61 and provided with a belt-pulley 3 driven by a belt 32. The frame 1 is provided with a bracket 22, carrying a table 24, which is by means of a screwed spindle 26 provided with a hand-wheel 25 slidable in a guide 23 and positioned at an oblique angle to the guide 8. A shaft 16, provided with a belt-pulley 18 is journaled in bearings 15 on the table 24, said shaft being driven by means of a belt 81 on the pulley 18. The center-line of the shaft 16 intersects the extended center-line of the shaft 9 in the center of the spherical surface to be ground. The shaft 16 carries the grinding-wheel 28 within range of the work-piece 19.

In order to make it possible for the grinding-wheel to be introduced into the sleeve-shaped work-piece 19, the diameter of the grinding wheel as clearly shown in the figure must be made not larger than the diameter of the apertures of the work-piece, the boundary of which apertures are preformed by the spherical surface of which the cavity of the work-piece forms a portion. The planes of these apertures form tangential planes to the smaller circle, shown in the drawing with dot and dash lines within the sleeve-shaped work-piece 19. A grinding-wheel of the size a, therefore can be introduced, while the diameter of the circular tangential planes to this smaller sphere which are cut out by the spherical surface of the cavity of the work-piece are of the same size as the diameter of the grinding tool. When rotating the work-piece 19 on the shaft 9 and the grinding-wheel 28 on the shaft 16, the center-lines of which shafts intersect each other in the center of the spherical surface of the cavity of the work-piece, an exactly spherical surface is imparted within the work-piece 19. The grinding is mainly effected along the surface of a zone of a sphere, forming the intersection between the operative surface of the grinding-wheel and the spherical surface within the work-piece. In the same degree as the grinding-wheel is worn, it is fed backward axially on its shaft of rotation by means of the hand-wheel 25, so that the grinding-wheel from the position a', successively takes in the positions a_2 and a_3 and finally a_4, as shown with dot and dash lines in the drawing. During the whole time an exactly spherical surface will be performed, since the above-mentioned mutual positions of the shafts, tool and work-piece continually are present. When the grinding-wheel has been diminished to the size a_4 it has reached its limit and cannot be used further for the same size of work-piece, but must be replaced by another grinding-wheel. Thus it is necessary that the grinding wheel during the whole procedure projects through the apertures of both sides of the work-piece.

Having now particularly described and

ascertained the nature of my said invention, and in what manner the same is to be performed, I declare that what I claim is:—

A machine for grinding concave spherical surfaces comprising in combination a rotatable shaft, a grinding-tool on one end thereof, another rotatable shaft, a holder on the last mentioned shaft for supporting a ring-shaped work-piece so as to leave a free space between the work-piece and the opposing end surface of the holder, and means for journaling said shafts so that their center lines intersect each other in the center of the spherical surface to be ground, substantially as and for the purpose set forth.

In testimony whereof I have affixed my signature.

AXEL DANIELSSON.