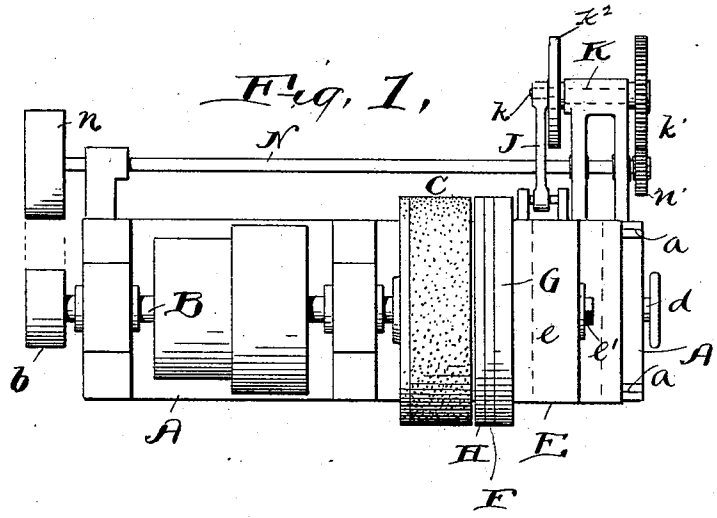
(No Model.) 2 Sheets—Sheet 1.

D. ROCHE.

BALL GRINDING MACHINE.

No. 588,915. Patented Aug. 24, 1897.

Fig. 1,



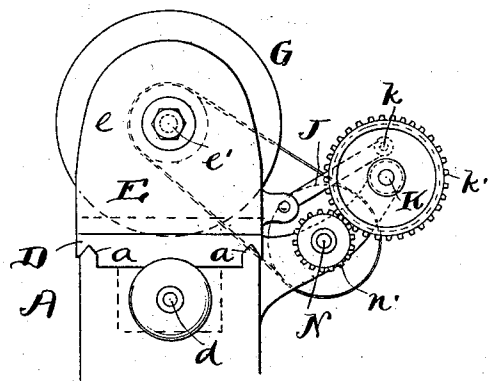


Fig. 2,

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(No Model.) 2 Sheets—Sheet 2.

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Fig. 4.

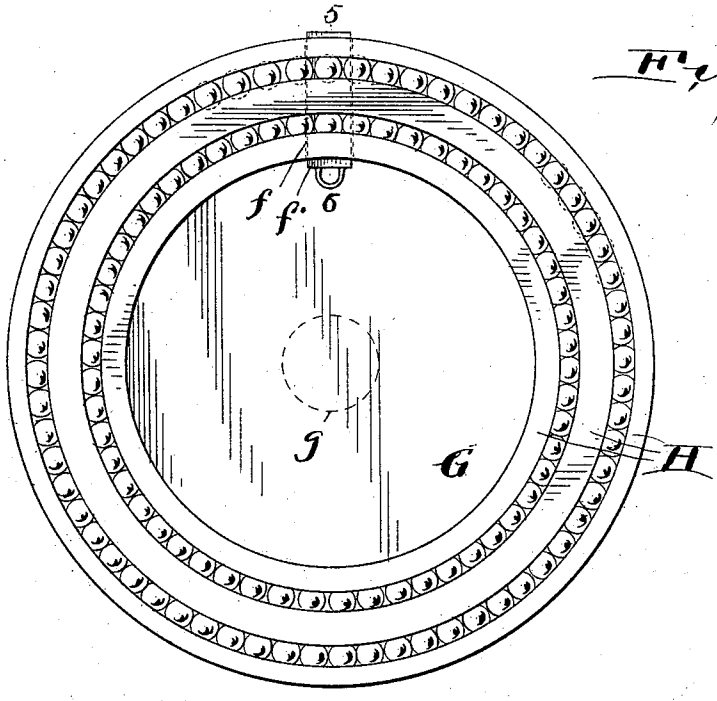


Fig. 5.

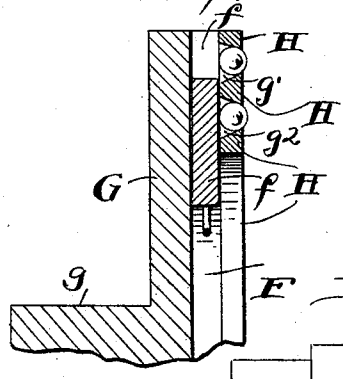


Fig. 6.

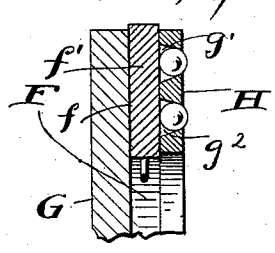
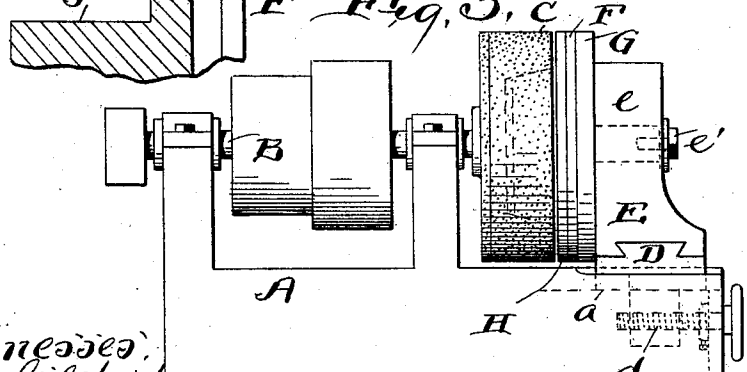


Fig. 3, C.



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UNITED STATES PATENT OFFICE.

DAVID ROCHE, OF CLEVELAND, OHIO, ASSIGNOR OF SEVEN-EIGHTHS TO F. H. KELLY, T. M. WARNER, AND A. G. HARBAUGH, OF SAME PLACE.

BALL-GRINDING MACHINE.

SPECIFICATION forming part of Letters Patent No. 588,915, dated August 24, 1897.

Application filed December 1, 1896. Serial No. 614,153. (No model.)

To all whom it may concern:

Be it known that I, DAVID ROCHE, a subject of the Queen of Great Britain, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Ball-Grinding Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The object of my invention is to provide a cheap, simple, and practical machine wherewith the more or less imperfect balls from a turning-machine may be quickly and accurately ground into true spherical form.

The invention consists in the construction and combination of parts hereinafter described and claimed.

In the drawings, Figure 1 is a plan view of my machine. Fig. 2 is an end view thereof. Fig. 3 is a front elevation thereof. Fig. 4 is a face view of the disk which supports the ball-raceways. Figs. 5 and 6 are sectional views on line 5 and 6 of Fig. 4, showing the key in two different positions.

Referring to the parts by letter, A represents the bed-plate of the machine, and B a shaft suitably mounted thereon. C represents a grinding-wheel which is secured to the end of this shaft.

D represents a longitudinally-movable slide mounted on guides *a a* and adjustable toward and from the grinding-wheel by a screw *d*.

E represents a slide transversely movable upon the slide D, this slide E carrying a vertical plate *e*, which is parallel to the grinding-face of the grinding-wheel C.

G represents a disk having a stud *g*, which is journaled in the plate *e* in line with the shaft B. This disk is during the grinding operation rigidly secured to the plate *e* by a clamping-screw *e'*.

Secured to that side of the disk which faces the grinding-wheel is a hard-metal ring F, across which at one point a radial keyway *f* is cut, and *f'* represents the key, which is fitted therein, its outer face being flush with the face of the ring. The depth of this keyway must be slightly greater than the diameter of the balls, since it is through this keyway that the balls are admitted to the ball-raceways g' g^2.

Each ball-raceway is formed by two concentric rings H, of different diameters, which are secured to the ring F. The outer periphery of the inner ring and the inner periphery of the outer ring are undercut, whereby the raceways decrease in width from the ring F outward, being too narrow at their outer edges to permit the balls to pass through. The thickness of the rings H is less than the diameter of the balls, whereby a small portion of said balls project from the raceway. Two of these raceways are shown, but any desired number could be formed, as described.

The slide E is moved forward and backward continuously by a pitman J, pivoted to it and to a crank-pin k on a disk k^2, which is fast upon shaft K. Motion is transmitted to this shaft K through gears k' and n', secured, respectively, to shafts K and N. The latter shaft is rotated by a belt running over pulleys n and b on the two shafts N and B.

To fill either raceway with balls, the key f' is drawn inward past said raceway and the balls are dropped into the keyway, from which they flow into the said raceway.

The slide D is moved toward the grinding-wheel until the balls touch the grinding-surface. Then as the grinding-wheel revolves the slide E is moved backward and forward. The two movements cause the balls to so revolve in their raceways that all parts of their surfaces are ground smoothly and symmetrically, and at the same time no grooves are worn in the grinding-wheel.

When the balls are ground sufficiently, the slide D is moved backward, and the disk G is rotated until the keyway is at the lowest point. The key is then drawn inward and the balls roll out through the keyway.

Having described my invention, I claim—

1. In a ball-grinding machine, in combination, a revolving grinding-wheel, a slide D adjustable toward and from the grinding-face of said wheel, a transversely-movable slide E mounted on the slide D, and means for imparting to the slide E a reciprocating motion, an upright disk secured upon the slide E, and two concentric rings of different diameters on the face of said disk, the proximate pe-

ripheries of said rings being undercut, and means for introducing the balls into the raceway formed between said rings, substantially as and for the purpose specified.

2. In a ball-grinding machine, in combination, a revolving grinding-wheel, a slide D adjustable toward and from the grinding-face of said wheel, a transversely-movable slide E mounted on the slide D, and means for imparting to the slide E a reciprocating motion, an upright disk secured upon the slide E, a hard-metal disk F secured to the face of this disk having a keyway across it, a movable key fitted in said keyway, and two concentric rings of different diameters secured to the ring F, the proximate peripheries of said rings being undercut, substantially as and for the purpose specified.

3. In a ball-grinding machine, in combination, a revolving grinding-wheel, a slide D adjustable toward and from the grinding-face of said wheel, a transversely-movable slide E mounted on the slide D and means for imparting to the slide E a reciprocating motion, a vertical plate carried by said slide E, a disk pivoted to said plate, a clamping device for rigidly connecting said disk and plate, a hard-metal disk F secured to the face of this disk having a keyway across it, a movable key fitted in said keyway, and two concentric rings of different diameters secured to the ring F, the proximate peripheries of said rings being undercut, substantially as and for the purpose specified.

In testimony whereof I affix my signature in presence of two witnesses.

DAVID ROCHE.

Witnesses:
E. L. THURSTON,
F. P. MILLER.