(No Model.)

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MECHANISM FOR GRINDING ANTIFRICTION BALLS.

No. 560,940. Patented May 26, 1896.

Fig. 1.

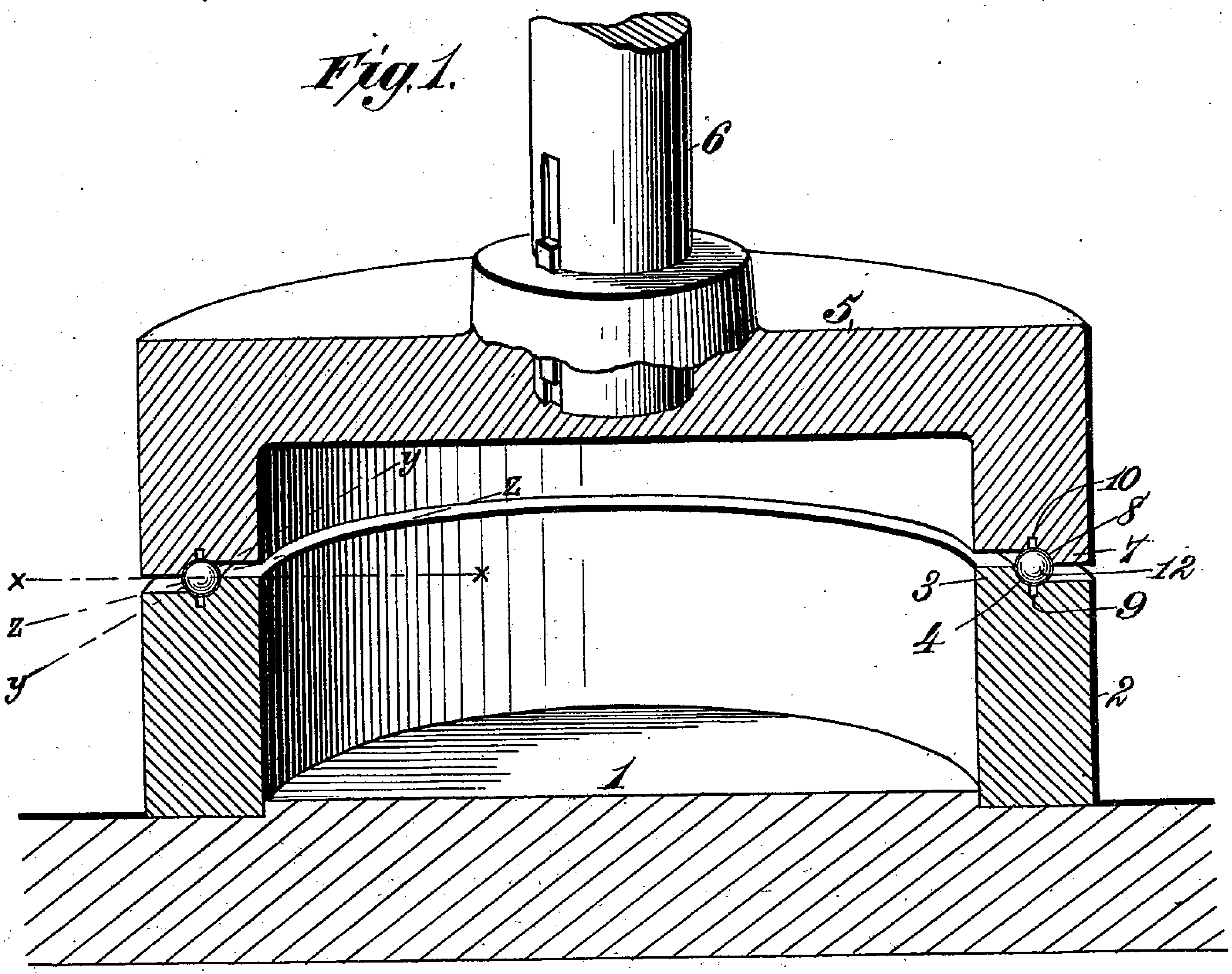


Fig. 2.

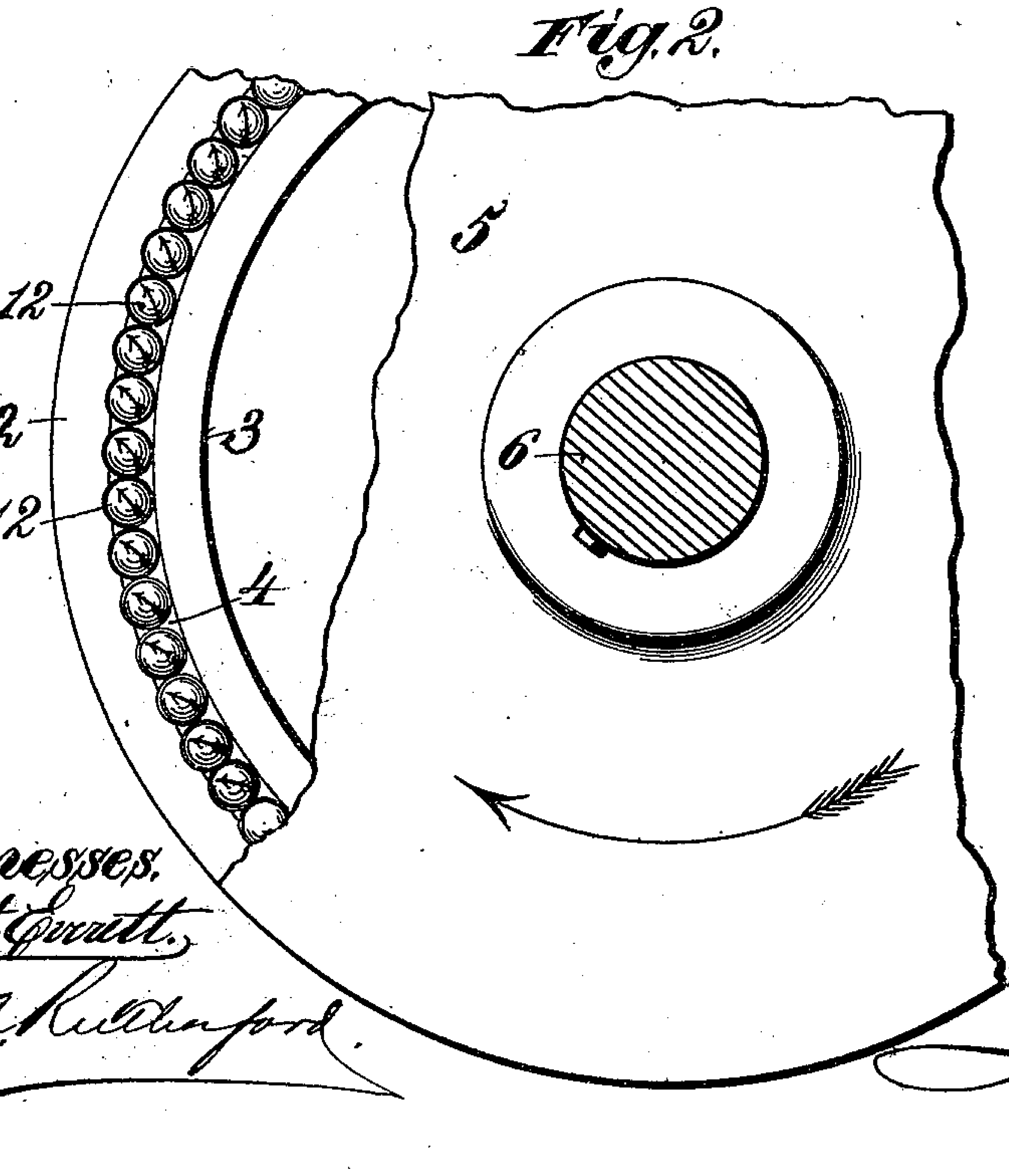
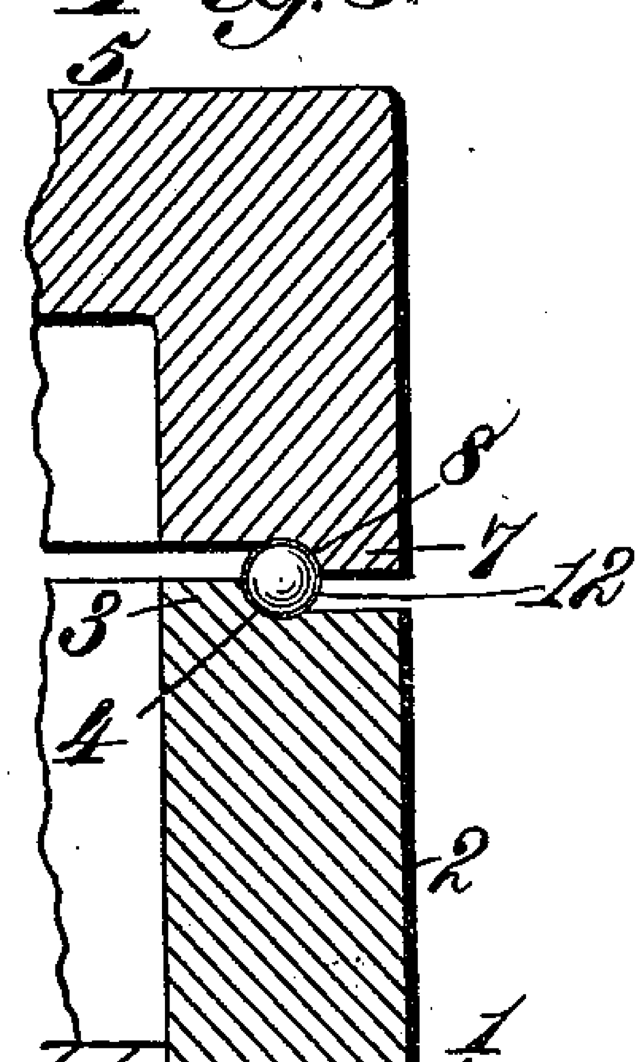


Fig. 3.



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UNITED STATES PATENT OFFICE.

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MECHANISM FOR GRINDING ANTIFRICTION-BALLS.

SPECIFICATION forming part of Letters Patent No. 560,940, dated May 26, 1896.

Application filed February 2, 1892. Serial No. 420,115. (No model.)

To all whom it may concern:

Be it known that I, GEORGE F. SIMONDS, a citizen of the United States, residing at Fitchburg, in the county of Worcester and State of Massachusetts, have invented new and useful Improvements in Mechanism for Grinding Antifriction-Balls, of which the following is a specification.

The object of this invention is the production of spherical rollers or balls having their surfaces uniformly ground to form perfect spheres, whereby the said balls are better adapted to the purposes of their use in antifriction-bearings to economize power, obviate wear, avoid necessity of lubrication, prevent the bearings from becoming heated, and lessen or prevent noise.

My invention consists in mechanism for grinding metallic spherical rollers or balls to produce perfect spheres, as hereinafter described and claimed.

In the annexed drawings, illustrating the invention, Figure 1 is a sectional elevation of my improved grinding-machine for grinding antifriction-balls to convert them into perfect spheres. Fig. 2 is a partial plan of the same with a portion of the rotary grinding-disk broken away and showing its shaft in section. Fig. 3 is a sectional detail view.

The antifriction-balls commonly employed in ball-bearings are seldom, if ever, perfect spheres, owing to the impossibility of properly grinding them by ordinary methods, and such imperfectly and unevenly ground balls are therefore liable to wear irregularly and cause more or less injury to the bearing-surfaces with which they are used, as their rolling action will not be smooth and uniform.

For the purpose of imparting a perfectly spherical form to antifriction-balls I subject them to a process of grinding and polishing with oil and emery between annular diagonally-opposed grinding-surfaces that are preferably concave, one of said grinding-surfaces being stationary, while the other is rotated at a suitable speed.

By the diagonally-opposed arrangement of the respective stationary and rotary annular grinding-surfaces an annular body or series of balls in close contact with each other may be made to revolve around a common center at the same time that each ball is caused to rotate on its own axis in a plane that is diagonal to the circle in which all the balls are moved around their common center of revolution. This compound rotation of the several balls exposes their entire surfaces to a uniform grinding and polishing action, whereby they are speedily converted into perfectly spherical forms at slight expense.

Referring to the drawings, the numeral 1 designates a bed on which is firmly supported a lower stationary grinding disk or ring 2. As shown, the upper surface of this disk or ring 2 is formed with an annular ledge 3, which is preferably concaved on one side and the said concavity extended into the contiguous upper surface of the disk or ring, so as to form an annular concave grinding-surface 4 to receive the balls. Above the lower disk or ring 2 is an upper grinding-disk 5, keyed to a vertical shaft 6, that may be rotated by any suitable power. The under side of the rotary grinding-disk 5 is provided with a depending annular ledge 7, which, like the ledge 3, is also preferably concaved on one side in such a manner that the said concavity will extend into the contiguous lower surface of the disk-body to form an annular concave grinding-surface 8, diagonally opposed to the corresponding grinding-surface in the lower disk. These annular diagonally-opposed grinding-surfaces 4 and 8 may present unbroken concavities, as shown in Fig. 3; but, as shown in Fig. 1, I prefer to form in each annular concave grinding-surface 4 and 8 an annular recess 9 and 10, respectively, for the purpose of holding the oil and emery used in the grinding and polishing process. By providing these recesses or receptacles for the oil and emery the grinding-surfaces are protected from undue or irregular wear and preserved in proper operative form and condition. The respective upper and lower surfaces or parallel planes of the lower disk 2 and upper disk 5 are cut away, as shown in Figs. 1 and 3, on the inside of one of the concaved grinding-surfaces and on the outside of the other of said concaved grinding-surfaces, thereby providing complete clearances at opposite sides of the grinding-surfaces that will prevent any dragging action or obstruction to the proper rotation of the balls in planes diagonal to a general circular direction of movement. I am thus enabled to obtain a perfectly even grinding action simultaneously upon the opposite surfaces of the balls while they are being uniformly rotated in an annular series around a common center and in planes diagonal thereto. The balls 12 are placed in close contact with each other between the diagonally-opposed grinding-surfaces 4 and 8, as shown, and the said grinding-surfaces being supplied with oil and emery the disk 5 is rotated. It will be seen that the balls as rotated between the disks 2 and 5 would naturally turn on their axes $x\ x$, if there were no opposing forces to prevent; but by the peculiar construction of the working parts of the disks the grinding-surfaces 4 and 8 act on the balls in a way that tends to cause them to turn, were there no opposing forces, on their axes $y\ y$, and as the said grinding-surfaces are formed partly in the sides of the ledges 3 and 7 and partly in the contiguous horizontal portions of the disks the balls will be caused to rotate on axes between $x\ x$ and $y\ y$—say the line $z\ z$—and thus every part of each ball is subject to a uniform action in the grinding process.

In Fig. 2 the general movement of all the balls around a common center is indicated by a large arrow, while the diagonal rotation of each ball is indicated by small arrows. This compound rotation of the several balls between the diagonally-opposed grinding-surfaces 4 and 8 around a common center and in planes diagonal to their general circular direction of movement exposes the entire surface of each and every ball to a uniform grinding and polishing action, so that they will be brought at small expense and in a short time to the form of perfect spheres, whereby their value is greatly enhanced for all the purposes to which such balls are applicable.

What I claim as my invention is—

In a machine for grinding antifriction-balls into perfect spheres, a pair of disks each of which is provided with an annular concaved grinding-surface diagonally opposed to the grinding-surface of the other disk, the parallel planes of said disks being cut away on the inside of one of the concaved grinding-surfaces and on the outside of the other of said concaved grinding-surfaces, substantially as and for the purpose described.

In testimony whereof I have hereunto set my hand and affixed my seal in presence of two subscribing witnesses.

GEO. F. SIMONDS. [L. S.]

Witnesses:

JAMES A. RUTHERFORD,

J. HARRY DALY.