

(No Model.)

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MECHANISM FOR GRINDING ANTIFRICTION BALLS.

No. 560,941.

Patented May 26, 1896.

Fig 1.

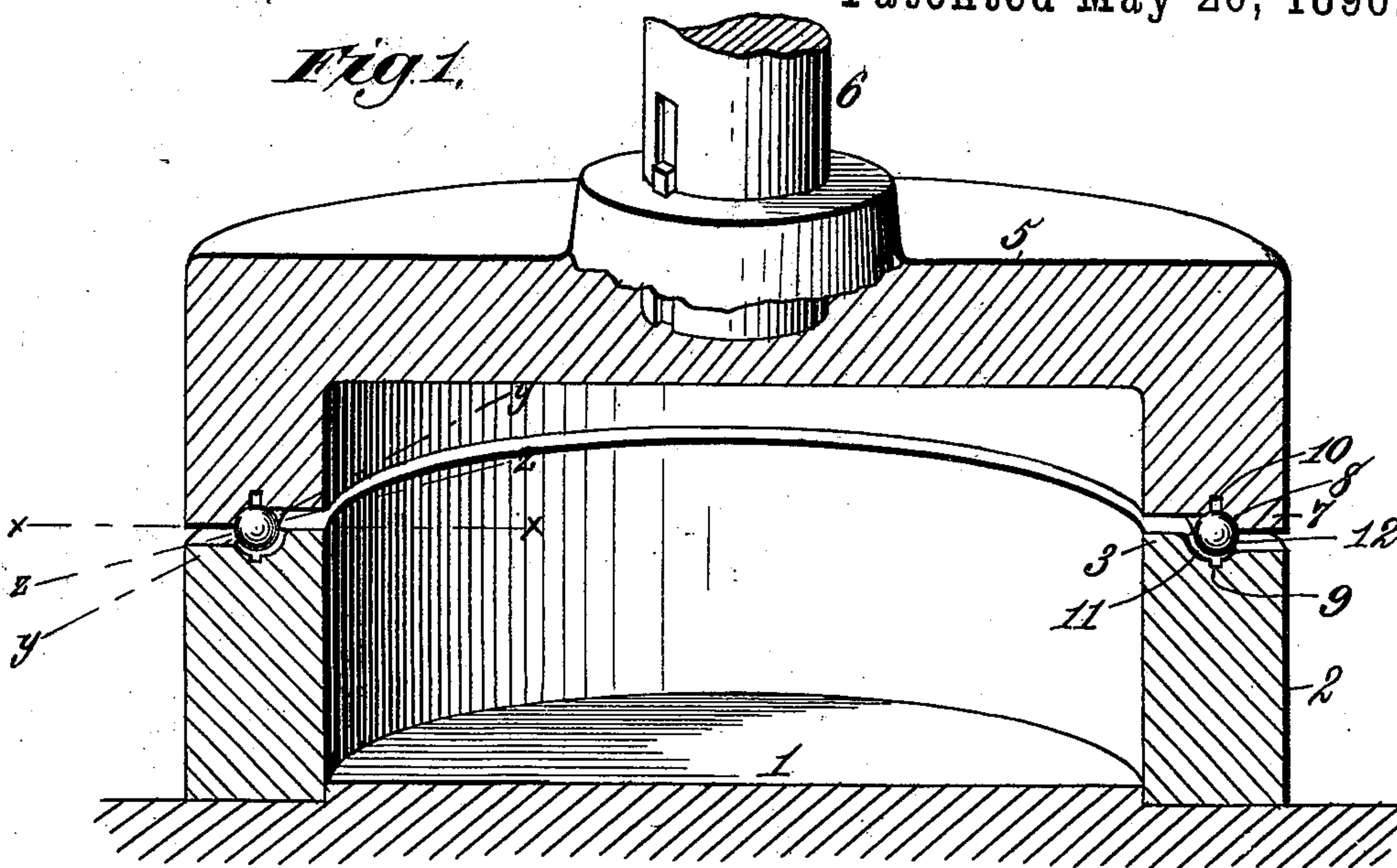
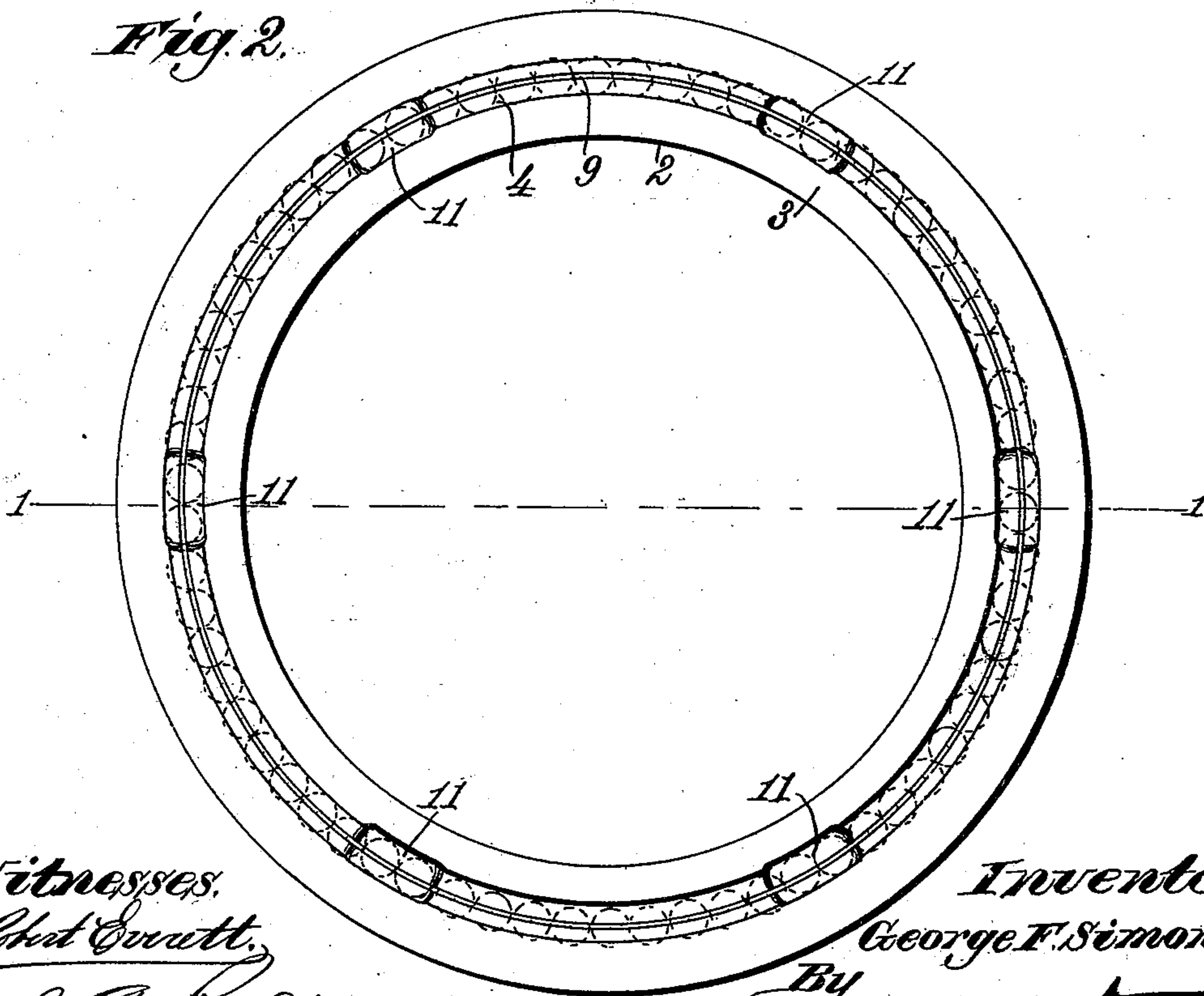


Fig 2.



Witnesses.

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MECHANISM FOR GRINDING ANTIFRICTION-BALLS.

SPECIFICATION forming part of Letters Patent No. 560,941, dated May 26, 1896.

Application filed August 8, 1892. Serial No. 442,506. (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 to Produce Perfect Spheres, of which the following is a specification.

The object of this invention is the production of perfectly spherical rollers or balls having their surfaces uniformly and smoothly ground, whereby the said balls are better adapted to the purposes of their use in anti-friction-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 the peculiar features of construction and novel combination of parts in a machine for grinding antifriction-balls to convert them into accurately spherical bodies, as hereinafter more particularly described and claimed.

In the annexed drawings, illustrating the invention, Figure 1 is a sectional elevation, on lines $x x$, Fig. 2, of my improved machine for grinding metallic balls to convert them into perfectly spherical antifriction-rollers. Fig. 2 is a plan of the lower grinding-disk.

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

In another application, Serial No. 420,115, filed February 2, 1892, I have described and claimed a somewhat similar mechanism for grinding metallic balls in such a manner as to produce perfect spheres for antifriction purposes. According to the said invention, I subject the balls to a grinding and polish-

ing action 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.

The novel feature of my present invention consists in means for changing at regular intervals the direction of rotation of each ball in planes diagonal to the general circular direction of movement of all the balls, whereby the several balls have imparted thereto such movements as will insure a thorough exposure of their entire surfaces to the action of the grinding and polishing agents. This result is accomplished by providing in the lower annular concaved grinding-surface, at suitable intervals, a series of depressed and somewhat widened pockets, into which the balls will successively drop and roll or wobble in such manner as to change their direction of rotation, so that when crowded out of said pockets onto the intervening annular concaved grinding-surfaces by the succeeding balls they will necessarily present fresh surfaces to the action of the grinding mechanism.

Referring to the accompanying drawings, the numeral 1 designates a bed on which is firmly supported a lower stationary grinding disk or ring 2, the upper surface of which is formed with an annular ledge 3, that is preferably concaved on one side, the said concavity being 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 power 5 applied in any convenient manner. 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 10 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 are 15 preferably each provided with an annular recess 9 and 10, respectively, for the purpose of holding the oil and emery used in the grinding and polishing operation. By providing 20 these annular 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.

At suitable intervals in the annular concave grinding-surface 4 of the lower grinding-disk 2 are formed a series of elongated, depressed, and widened recesses or pockets 11, into which the balls 12 will successively drop and wobble or roll about in such a manner 30 that the direction of rotation of each ball on its axis will be changed before it is crowded by the following balls into the next succeeding portion of the diagonally-opposed annular concaved grinding-surfaces.

For the purpose of grinding and polishing 35 metallic balls to produce perfect spheres that will give the best antifriction results the balls 12 are placed, in close contact with each other, between the diagonally-opposed grinding-surfaces 4 and 8 and in the pockets or recesses 11 of the lower grinding-disk, and the said grinding-surfaces being supplied, if desired with oil and emery, the movable disk 40 is rotated.

It will be seen that the balls as rotated between the disks 2 and 5 would naturally turn on their axes xx if there were no opposing forces to prevent; but by the peculiar construction of the working parts of the disks 45 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 yy , and as the said grinding-surfaces are formed partly in the sides of the ledges 3 and 55 7 and partly in the contiguous horizontal por-

tions of the disks the balls will be caused to rotate on axes between xx and yy —say the line zz —and thus every part of each ball is subjected to a uniform action in the grinding process. This result is further insured by the 60 provision of the series of recesses or pockets 11 in the annular concaved grinding-surface of the lower disk, as it is obvious that as the balls are caused to travel in a general circular direction along this lower grinding-surface 65 they will successively drop into said recesses or pockets 11 and roll or wobble about therein so as to change their direction of rotation in diagonal planes before they are crowded out and between the diagonally-opposed 70 grinding-surfaces 4 and 8 by the pressure of the following balls. While all the balls thus have, during the grinding operation, a general movement around a common center, each ball is also caused to rotate in planes diagonal 75 to the general circular direction of movement, and as a complete change in the position of each ball is effected at frequent intervals by its dropping into and rolling about in the pockets 11 it is obvious that the entire sur- 80 face of each and every ball will be exposed to a uniform grinding and polishing action. By this means the balls will be brought, at small expense and in a short time, to the form of perfect spheres, whereby their value is greatly 85 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 to convert them into perfect spheres, a pair 90 of disks each of which is provided with an annular grinding-surface diagonally opposed to the grinding-surface of the other disk, the lower one of said disks being provided at intervals with pockets into which the balls are 95 adapted to successively drop and roll about, whereby the balls, during the operation of grinding, are revolved around a common center, at the same time rotated in planes diagonal to their general circular direction of 100 movement, and the position and direction of rotation of each ball changed at intervals, substantially as described.

In testimony whereof I have hereunto set my hand and affixed my seal in presence of two 105 subscribing witnesses.

GEORGE F. SIMONDS. [L. S.]

Witnesses:

HOWARD M. NORRIS,
J. A. RUTHERFORD.