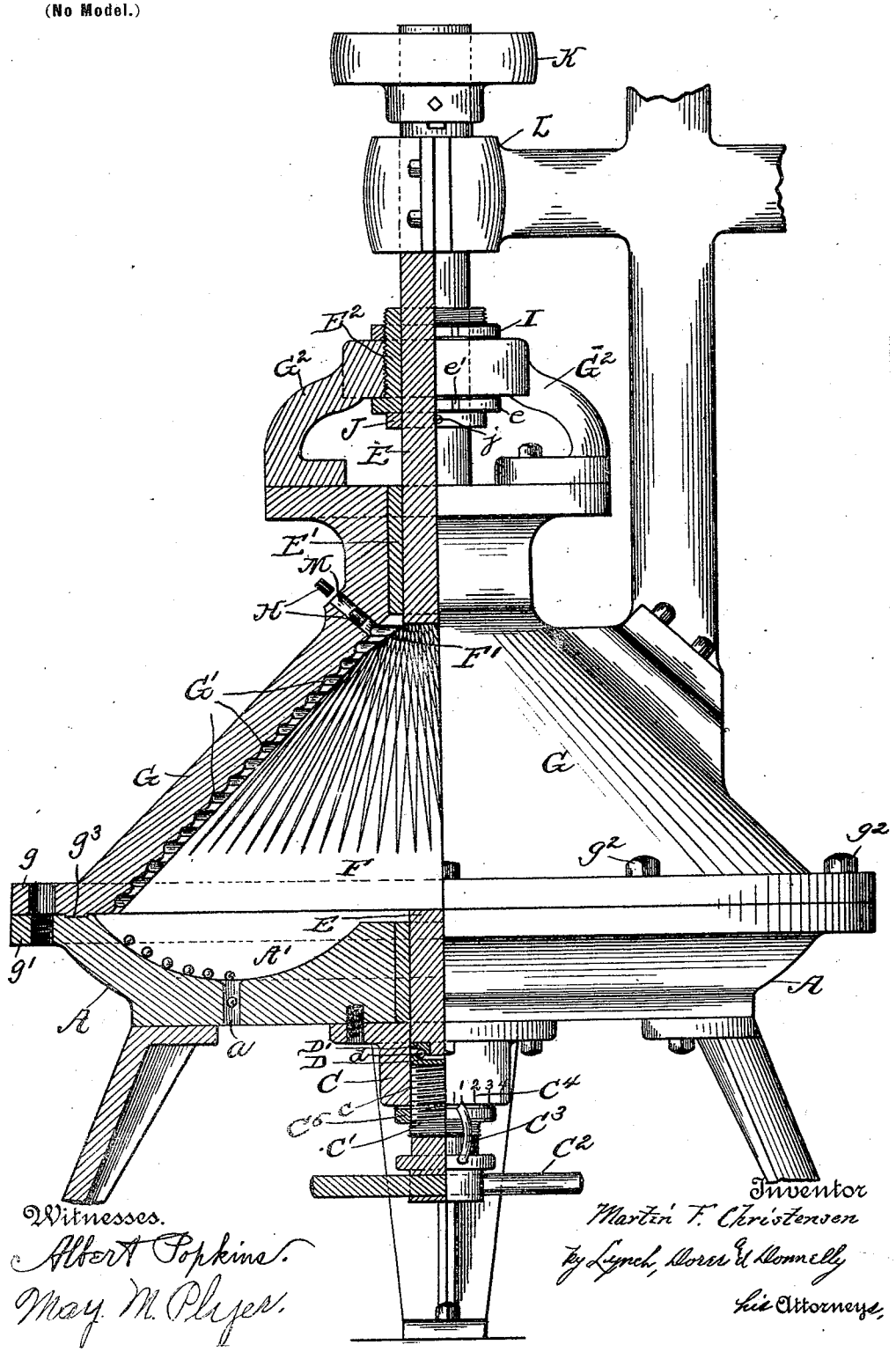
No. 632,336. Patented Sept. 5, 1899.

M. F. CHRISTENSEN.

APPARATUS FOR PRODUCING METALLIC SPHERES.

(Application filed Mar. 7, 1899.)

(No Model.)



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UNITED STATES PATENT OFFICE.

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APPARATUS FOR PRODUCING METALLIC SPHERES.

SPECIFICATION forming part of Letters Patent No. 632,336, dated September 5, 1899.

Application filed March 7, 1899. Serial No. 708,122. (No model.)

To all whom it may concern:

Be it known that I, MARTIN F. CHRISTENSEN, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Machines for and Methods of Forming Spherical Bodies; and I do 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, reference being had to the accompanying drawing, and to the letters of reference marked thereon, which forms a part of this specification.

My invention relates to apparatus for producing metallic spheres, and the novel features of the invention will be fully described hereinafter and then defined in the appended claims.

The accompanying drawing is an elevation, partly in section, of the machine employed by me in producing metallic spheres or bodies.

In carrying out my invention I cut from a metallic rod of proper cross-section a blank of a length approximately equal to its greatest diameter or cross-section. The blank may be slightly longer or shorter than the greatest diameter of the rod. The blank thus severed may be heated, if desired or found necessary; but in some cases the heating of the blank is unnecessary. The blank is now fed into a machine which will give to the blank a movement similar to a gyratory motion and will roll the blank about its axis in every direction, and thus knead the blank until the grain of the same in the finished ball has been contorted and the metal is in a sense homogeneous and has no special grain.

Spherical bodies formed in the manner above set forth are so rolled, kneaded, condensed, and compressed during their formation that the grain of the metal is contorted, and the product will not split, crack, or break, as do such bodies which are produced by drop-forging, turning, or by rolling the blank in one direction with respect to its axis. In carrying out my invention I have designed a machine which is especially adapted for the purpose. This machine is illustrated in the drawing and is preferably constructed substantially as follows:

A represents the base of my machine, which is preferably formed with an annular chamber A′, which serves as a receiver for the finished balls or spheres. The chamber A′ is provided with an outlet *a* for discharging the balls. Secured centrally to the base and underneath the same is a hollow flanged boss C, which is screw-threaded internally, as at *c*, to receive the adjusting-screw C′. The adjusting-screw C′ is provided with suitable means for operating or turning it, such as bars or handles C^2, and also with a pointer C^3, which coöperates with a micrometer-scale C^4, thus forming a micrometer-adjusting device. A lock-nut C^5 is provided for locking the screw C′ after it is properly adjusted.

D D′ represents hard metallic plates which are so shaped that a ball-race for balls *d* is formed between them. The plates D D′ are located above the screw C′ and beneath the vertical shaft E of the machine, thus forming an antifriction step-bearing for the shaft E.

F represents a vertical rotatable conical roller which is mounted on and operated by shaft E. The operating-face of roller F may be formed plain and smooth or may be roughened by fluting or cross-fluting thereon in any suitable manner, either wholly or a part of its area. Shaft E extends vertically through the roller F and is supported at its upper portion in a suitable bearing E′, arranged in the upper end of a casing G, which will be hereinafter described. Casing G surrounds the conical roller F and is secured in any suitable manner to the base A, as by means of flanges *g g′* and screw g^2 and an annular mortise and tenon g^3, which forms a rigid connection for the parts. The inner or operative face of the casing G is provided with a spiral groove G′, which is preferably formed in the said face, so as to be uniform both in depth and width and preferably of uniform pitch. I also prefer to round the edges of the groove G′, as illustrated, which gives to the inner face of the casing G a corrugated appearance. The object in rounding the edges of the groove G′ is to lessen the danger of cutting, abrading, or shaving the blank during its manipulation in the machine, which might result if the corners of the groove G′ were left sharp.

The inner face of the casing G is at an angle which is uniform throughout from its upper end to its base, and the angle is coincident with or the same as the angle of the major portion of the roller F. In order to

allow the blank H to be properly fed to the machine and between the roller F and casing G, I prefer to slightly change the angle of the roller F at its upper portion, as at F′, and form this portion of the roller at a greater inclination than the remainder thereof, as shown, leaving a short wedge-shaped space to catch or "bite" the blank, and thus more readily feed the blank to the machine.

As hereinbefore stated, the upper end of the casing G is provided with a bearing E′ for the purpose of supporting shaft E, and this bearing E′ is the main upper bearing for said shaft and the roller F. Above the bearing E′, I provide a vertically-adjustable bearing E^2, which is located in and supported by a yoke G^2. The bearing E^2 is provided with an external screw-thread which engages an internal thread formed in yoke G^2, and it is adjusted by turning the bearing in the desired direction. A flange-head *e*, having notches *e′*, is formed at the lower end of the bearing E^2 for the purpose of adjusting the bearing by means of a spanner-wrench. A lock-nut I engages the screw-thread of the bearing E^2 above the yoke G^2 and locks the bearing in its adjusted position. J represents a collar, which is adjustably secured to the shaft E beneath the bearing E^2 by means of a screw *j*. The adjustable bearing E^2 and collar J act as an auxiliary to the micrometer-adjustment beneath the step of the shaft E for the purpose of securing the said shaft and its attached roller F from "jumping" or "chattering." The upper end of the shaft is provided with suitable devices for receiving motion—such, for instance, as a pulley K. In this connection a bearing L, properly supported, may be employed to steady the upper end of the shaft E.

What I claim, and desire to secure by Letters Patent, is—

1. A machine for producing spherical bodies, comprising a stationary conical casing having its inner surface formed with a continuous spiral groove, in combination with a revoluble conical roller coöperating with the grooved surface of the stationary casing to force a blank which enters the upper end of said groove, in a spiral path around between the casing and roller from the apex to the base of the cone to knead and compress the blank into a homogeneous sphere, and discharge the same from the lower end of the spiral groove.

2. A machine for producing spherical bodies, comprising a stationary conical casing having its inner surface spirally grooved substantially throughout its length, a rotating conical roller, the exterior surface of the latter being so constructed that two different angles are formed with respect to its axis, one angle being greater than the other, and means for driving said roller.

3. A machine for producing spherical bodies, comprising a stationary conical casing having its inner surface spirally grooved substantially throughout its length, said groove being constructed so that no abrupt edges or shoulders are formed therein, a rotating conical roller within said casing, said roller being provided with a roughened surface, and means for driving said roller.

4. A machine for forming spherical bodies, comprising a stationary conical casing having its inner surface spirally grooved, a rotating conical roller within the casing, the exterior surface of said roller being roughened and so constructed that two different angles are formed with respect to its axis, and means for driving the said roller.

5. A machine for forming spherical bodies, comprising a stationary conical casing having its interior surface spirally grooved, a rotating conical roller mounted within said casing, the exterior surface of said roller formed with two different angles with respect to its axis, a shaft for driving said roller, and adjusting means for said shaft, said adjusting means constituting a bearing for the lower end of the driving-shaft.

6. A machine for forming spherical bodies, comprising a stationary conical casing having its inner surface spirally grooved, a rotating conical roller mounted within the casing, a shaft for driving said roller, adjusting means for adjusting the shaft vertically and constituting a bearing for the lower end thereof, a yoke above said stationary casing, a vertically-adjustable bearing mounted in said yoke, and a collar secured to the shaft below said adjustable bearing.

7. A machine for producing and finishing balls, comprising two parts so disposed in relation to each other as to receive and operate upon a blank placed between them, one of said parts being provided with a spiral groove which constitutes a continuous raceway for the balls and the other of said parts being provided with grooves arranged to cross the spiral groove constituting said raceway, said parts being revoluble in relation one with the other, whereby the blank is carried around between the two parts and through the spiral and formed in its passage substantially as described.

8. A machine for making and finishing balls, comprising a stationary conical casing provided with a tapering spiral groove in its inner surface and a revoluble conical roller disposed in the casing and having its superficial incline arranged at a different angle to the incline of the casing to form an annular wedge-shaped space with grooves crossing and opposed to the pitch of the spiral in the casing whereby the balls are caused to traverse the spiral of the stationary casing, and means substantially as described for vertically adjusting the revoluble cone as specified.

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

MARTIN F. CHRISTENSEN.

Witnesses:
JAS. L. SKIDMORE,
JOS. H. BLACKWOOD.