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PATENTED FEB. 3, 1903.

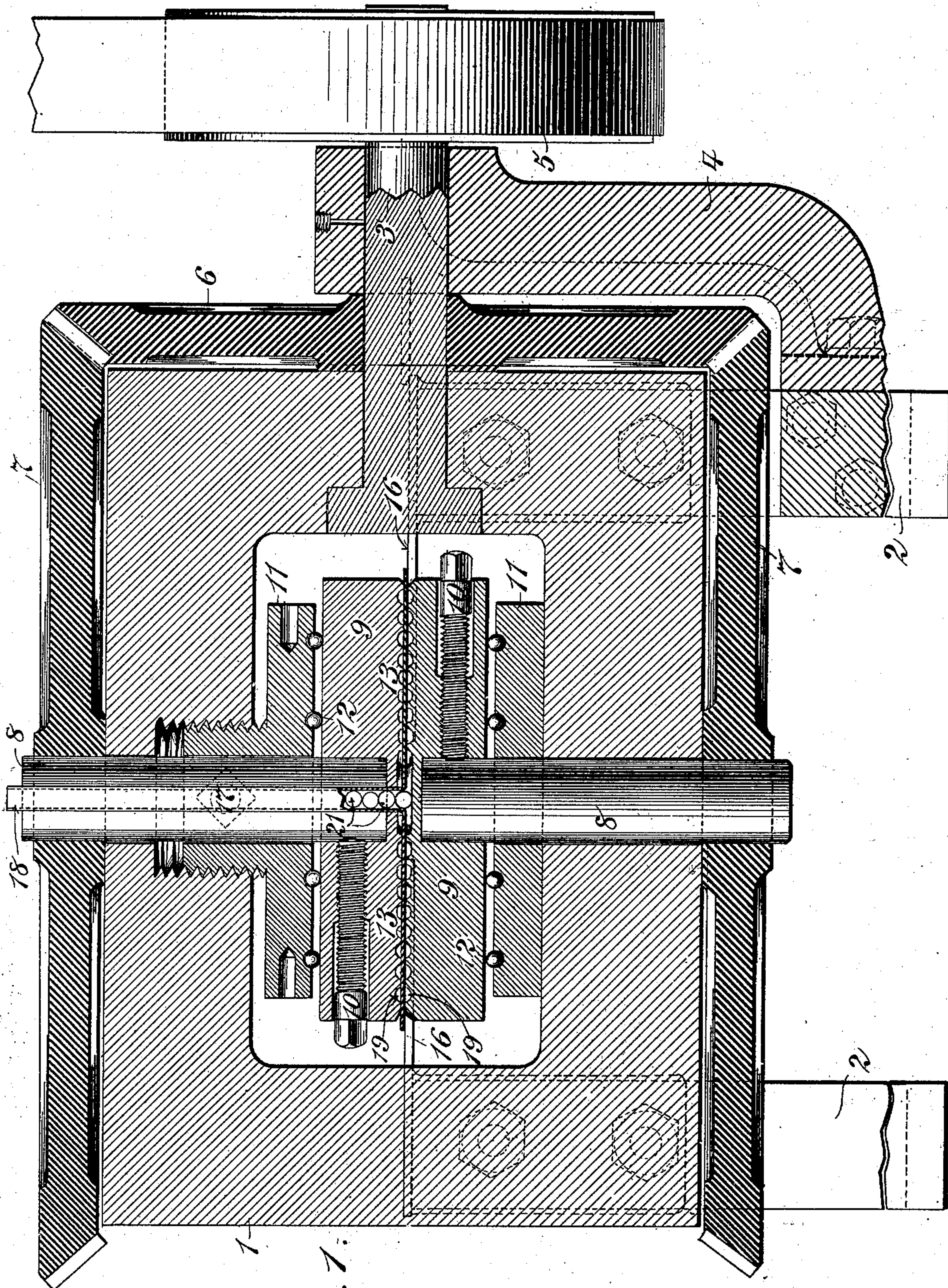
O. SPAHR.

MACHINE FOR ROLLING METAL BALLS.

APPLICATION FILED MAY 7, 1902.

NO MODEL.

2 SHEETS—SHEET 1.



Witnesses
Edward Rowland.
M. F. Keating

Fig. 1.

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By his Attorney
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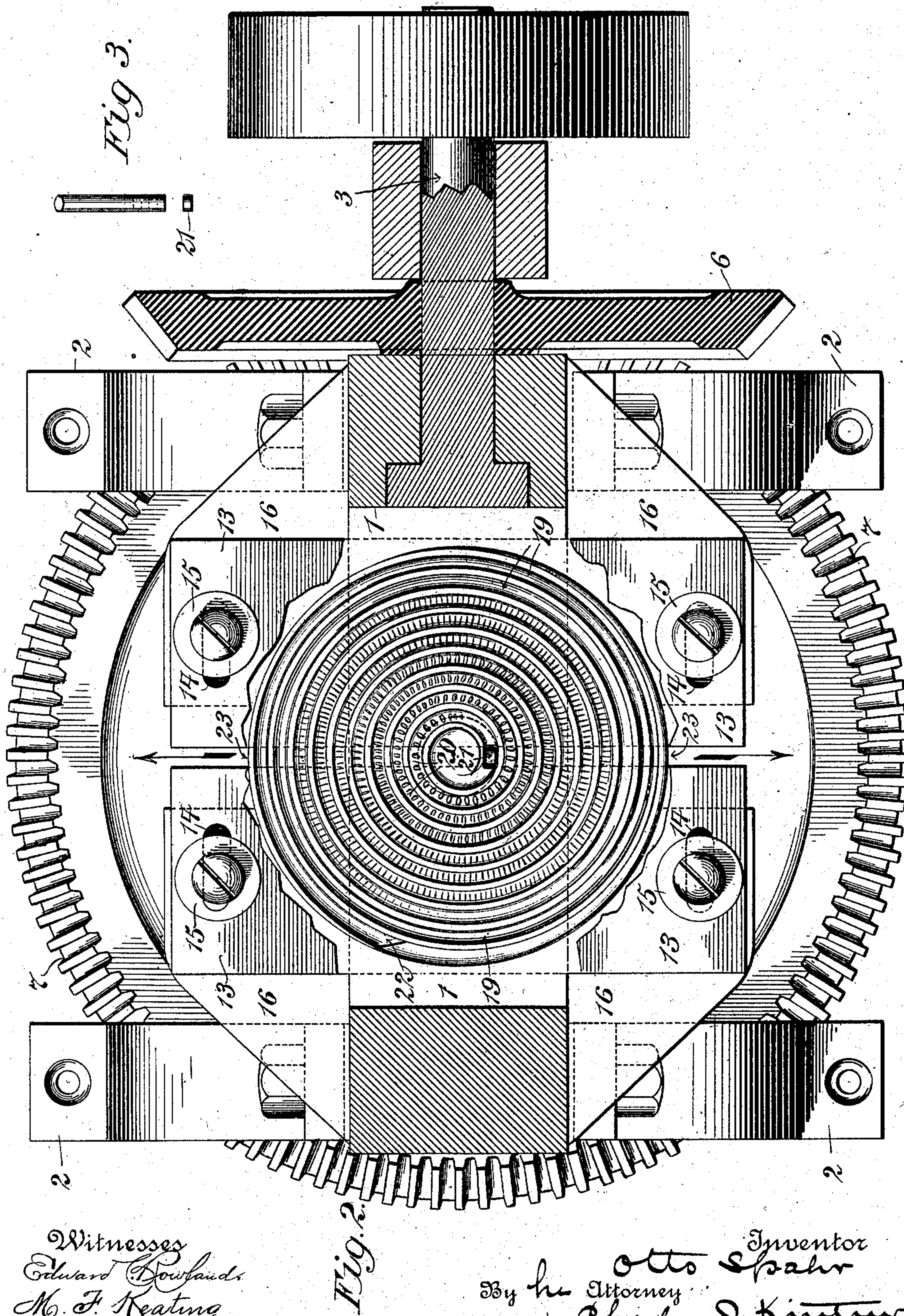
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UNITED STATES PATENT OFFICE.

OTTO SPAHR, OF KINGSBRIDGE, NEW YORK, ASSIGNOR OF ONE-FOURTH
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MACHINE FOR ROLLING METAL BALLS.

SPECIFICATION forming part of Letters Patent No. 719,959, dated February 3, 1903.

Application filed May 7, 1902. Serial No. 106,257. (No model.)

To all whom it may concern:

Be it known that I, OTTO SPAHR, a citizen of the United States, residing at Kingsbridge, county and State of New York, have made a
5 new and useful Invention in Mechanism for Rolling Metal Balls, of which the following is a specification.

My invention is directed particularly to improvements in mechanism for rolling metal
10 balls between rotating die-surfaces, and has for its objects, first, to provide novel mechanism for manufacturing balls from metal blanks by the rolling action of grooved dies thereon, and in such manner that the most
15 difficult part of the work which is required always occurs at the commencement of the operation and under the best conditions in the application of power in the movement of the blanks between the dies; second, to give to
20 the material from which the ball is made a continuous increase of speed in rotation between the dies from start to finish, so that it is completed at a high speed of rotation and is a perfect sphere; third, to provide novel
25 guiding means for guiding the balls in radial lines between the dies during the time that they are passing from the center thereof to the exterior surface, where they are completed and discharged; fourth, to provide novel
30 means of adjustment for the dies, whereby they may be quickly and effectually adjusted so as to give the best possible results.

For a full and clear understanding of my invention, such as will enable others skilled in
35 the art to construct and use the mechanism hereinafter described, reference is had to the accompanying drawings, in which—

Figure 1 is a vertical sectional view taken through the body of the machine, the shaft-
40 ing which drives the dies, the set-screws for connecting said shafting to the dies, the ball-bearings therefor and one end of the main driving-shaft, together with the driving-pulley and belt therefor, being shown in eleva-
45 tional view. Fig. 2 is a horizontal sectional view taken through the body of the machine, illustrating the driving-pulley, a part of the frame, and the lower die in plan view, the guiding-ways located between the dies being
50 broken away in order to more clearly illustrate the upper face of the lower die. Fig.

3 is a detail view illustrating the material from which the balls are to be made and one of the blanks detached therefrom.

Referring now to the drawings in detail, in
55 all of which like numerals of reference represent like parts wherever used, 1 represents the frame of the machine, of rectangular shape, and 2 2 the legs therefor, adapted to be secured to the floor by screws or in any pre-
60 ferred manner.

3 represents the driving-shaft, journaled at one end in the frame and at the other in an upwardly-extending bracket 4, 5 being the driving-pulley, provided with the usual driv-
65 ing-belt.

6 is a beveled gear-wheel meshing at its diametrically opposite sides with two larger beveled gear-wheels 7 7, secured directly to vertically-disposed shafts 8 8, journaled in
70 the frame 1.

9 9 are dies secured directly to the inner ends of the shafting by set-screws 10 10.

11 11 are adjusting-plates, the lower one surrounding the shaft 8 and resting directly
75 upon the inner upper surface of the frame 1, the upper one being adjustably secured by a screw-threaded neck in the top of the frame and surrounding the upper shaft 8, as shown.

12 12 are ball-bearings resting in grooves
80 between the outer faces of the dies 9 9 and the adjusting-plates 11 11.

17 is a set-screw for securing the upper adjusting-plate 11 to the frame from rotary movement after proper adjustment is ef-
85 fected.

Each of the dies is provided in its inner face with a spirally-disposed groove 19, a cross-section of said groove being the arc of a circle corresponding to the exterior surface
90 of the ball to be rolled. These grooves 19 are identically alike in the two dies, but are oppositely disposed when placed face to face, so that they cross each other.

22 is the exit or outer portion of each groove.
95 That portion of the grooves nearest the center of the die is provided with regularly-disposed corrugations or roughened surfaces 20 20, the roughness of which decreases gradually toward the outer end of each groove, so
100 that as the ball approaches the outer portion of its journey this roughness discontinues

and ultimately the groove is smooth, as shown. The function of this roughness is to enable the dies to grasp and gradually roll the blanks into spherical form.

18 is a guideway for the blanks, secured in a groove in the outer surface of the shaft 8, said guideway resting at its lower end in a pocket just below the lower end of the shaft 8 and so that when the blank is fed in it will drop directly into the groove 19 at the starting-point near the axis of the die.

21 represents a cylindrical metal blank from which a ball is to be made, said blanks being cut from a steel rod of the required diameter, as shown in Fig. 3. These blanks are fed in in succession at the top of the guideway 18.

13 13 are adjustable steel guideways secured to supporting-brackets 16 16 and fitting accurately between the faces of the two dies, said guideways being provided with oblong slots 14 14 and adjusting-screws 15 15 for varying the space between them.

The parts of the machine are assembled as follows: The driving-shaft 3 and driving beveled gear-wheel 6 being in position the lower beveled gear-wheel is placed in position meshing therewith and with the shaft 8 extending upward in its journal-bearing in the frame 1. The lower adjusting-plate 11 is then slipped into position over the upper end of the shaft 8, and the ball-bearings 12 placed in their grooves therein, after which the lower die, with its grooved face upward, is slipped into position over the upper end of the shaft and the lower set-screw 10 turned until the die is firmly secured to the shaft. Then the steel guideways 13 13 are placed in position over the face of the lower die 9 upon the supporting-brackets 16 16 and adjusted laterally by means of the slots 14 and screws 15 to the proper position, dependent upon the size of the ball to be made. The upper adjusting-plate 11 is then secured in position with its screw-threaded neck extending into the screw-threaded portion of the frame. The upper die is then placed in position, grooved face downward, and the ball-bearings 12 12 placed in the grooves between the adjusting-plate 11 and the upper face of said die. The shaft 8, its inclosed guideway 18, and the upper beveled gear-wheel 7 are then placed in position, with the lower end of the shaft extending into the upper die 9 and the guideway 18 extending into the pocket within said die in such manner as to be located directly above the inner end of the groove 19 of the lower die. The proper adjustment is now effected by turning the upper adjusting-plate 11 through the agency of a tool and the dowel-holes shown therein, after which the set-screw 17 and the upper set-screw 10 are secured in place, thus securing all of the parts in firm and accurate relation with each other, the ball-bearings lessening the friction when in operation between the dies and the adjusting-plates 11 11. The machine as thus described is now in readi-

ness for operation. The guideway 18 is filled with cylindrical blanks 21 of the proper diameter and the pulley 5 set in motion in the proper direction to rotate the lower die in the direction of the hands of a watch, and hence the upper die in a reverse direction. The blanks descend in the manner shown in Fig. 1, and as the dies are rotated said blanks are given rotation, and as the roughened surfaces of the two dies act thereon they are gradually given the conformation of spheres. At each half-revolution of the dies a blank will be dropped between them from the guideway 18. The guideways 13 will cause said blanks to be moved outward in the direction of the two arrows, so that ultimately the groove between the two guideways 13 will be filled with blanks in various stages of completion, and, finally, after the dies have been rotated a sufficient number of times the completed balls will drop out alternately at the opposite points 23.

It will be apparent that by reason of the initial slow speed of rotation of the dies at the center, where the blanks are first inserted, I am enabled to exert a maximum power upon the crude material, and also that by reason of the increased speed given to the ball in course of completion I am enabled to give to it rotation in all directions, the nature of the grooves being such that the balls finally reach the exit 22 when the latter is at the point 23 on either side of the machine, and perfect spheres are produced. The guideways 13 13 perform an essential function in that they prevent the biting action of the oppositely-disposed spiral grooves from producing any material shearing action upon the balls, thus tending always to guide them in opposite directions to their ultimate point of discharge from the exit 22 at the points 23.

I am aware that attempts have heretofore been made to manufacture rolled balls by grooved dies; but I am not aware that any one has been enabled to construct in this manner a rolled ball which is a perfect sphere. I believe it is broadly new with me to produce a metal ball by the rolling action of two grooved dies located face to face and provided with guideways between them for guiding the balls outward from the center of the dies, and my claims are generic as to this feature.

Having thus described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

1. Mechanism for rolling metal balls, consisting of two dies having spiral grooves in their adjoining faces; in combination with guideways between the dies and means for conveying the blanks from which the balls are made to a point near the center of the dies, substantially as described.

2. Mechanism for rolling metal balls, consisting of two dies having spiral grooves in their adjoining faces; in combination with guideways located between the dies, substantially as described.

3. Mechanism for rolling metal balls, consisting of two dies having spiral grooves in their adjoining faces; in combination with adjusting means for varying the distance between the faces of the dies, together with guideways located between said dies, substantially as described.

4. Mechanism for rolling metal balls, consisting of two dies having spiral grooves in their adjoining faces and adjusting means for varying the distance between the faces of the dies; said adjusting means being provided with ball-bearings, in combination with guideways between said dies, substantially as described.

5. Mechanism for rolling metal balls, consisting of two dies having spiral grooves in their adjoining faces; said grooves being provided with corrugations or roughened surfaces over a definite portion of their length, in combination with guideways between said dies, substantially as described.

6. Mechanism for rolling metal balls, consisting of two dies having spiral grooves in their adjoining faces and guideways between

said dies; in combination with means for delivering metal blanks to said grooves at their inner ends, substantially as described.

7. Mechanism for rolling metal balls, consisting of two dies having spiral grooves in their adjoining faces, said grooves being oppositely disposed; in combination with guideways located between the faces of the dies, substantially as described.

8. Mechanism for rolling metal balls, consisting of two dies having spiral grooves in their adjoining faces, said dies being operatively connected with driving mechanism adapted to move them in opposite directions; in combination with guideways adjustably secured between the faces of the dies, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

OTTO SPAHR.

Witnesses:

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CHARLES J. KINTNER.